THE Chemical Age

VOL. LXXI 21 AUGUST 1954 No. 1832

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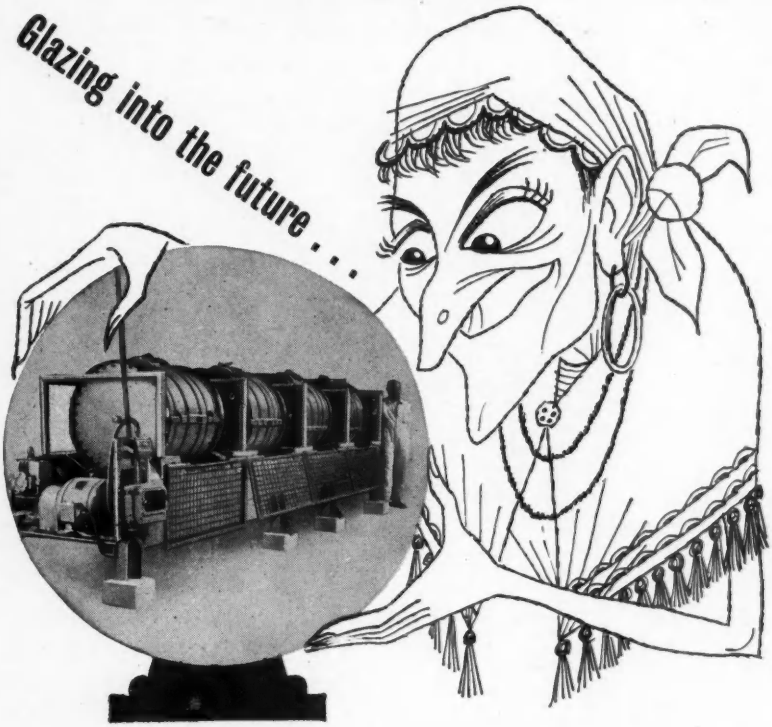

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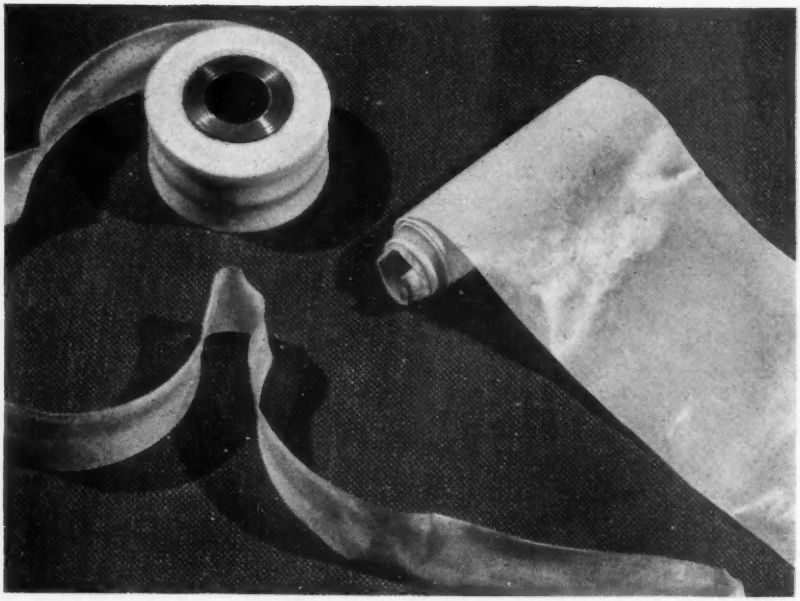

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Volume LXXI
Number 1832

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone: CENTRAL 3212 (26 *lines*) *Telegrams:* ALLANGAS · FLEET · LONDON

CONTENTS · 21 AUGUST 1954

Editor: E. A. Running *Publisher & Manager: John Vestey*

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Phone: Midland 0784/5

SCOTTISH OFFICE: 116, Hope Street, Glasgow, C.2.
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Food & Chemicals

THE more popular apprehensions about 'chemicals in foods' fail to distinguish between five different kinds of chemical penetration. Chemical substances not originally present in a natural foodstuff or foodstuff raw material may be associated with the finished product on the consumer's plate because: (1) residues of chemicals used to protect growing crops have been retained, (2) preservative chemicals have been used to reduce losses of food or of edibility during process or distribution, (3) contamination has occurred in processing or packaging, (4) artificial colouring or flavouring agents have been added to enhance the 'attractive' qualities of the food, and (5) chemical substances of genuine nutritional value have been added to enrich the food value of the foodstuff. It is surely very clear that people who believe in 'natural' food purity or food virginity cannot logically display the same amount of indignation about each of these different kinds of chemical 'interference.' Any generalised attack upon chemicals in modern foods is as out of date and impractical as the use of a blunderbuss in pitch darkness—the noise may be troublesome but the chances of hitting the target are poor and incalculable.

Going back to the fivefold list, it seems very right that the utmost care should be taken to minimise chemical infiltration due to (1), (2), and (3). This is indeed a field for strict legislation. Substances that carry human-toxic or animal-toxic hazards should not be used for crop protection or preservation unless (a) there are no alternative non-toxic substances capable of preventing losses of the foods concerned as efficiently, and (b) it is firmly proved that such losses must occur if these chemical means of protection or preservation are withheld. When these two basic conditions are satisfied, the law should lay down maximum standards for residue contamination, such standards ensuring that no consumer of the foodstuff, even a heavy consumer, can possibly acquire a total or accumulative 'dose' that would have toxic effects. Should some practice of crop protection or food preservation be unable to meet such standards, the particular chemical substance, however efficient it may be in controlling pests or degradation enzymes, must be banned. Merely to examine the technique of crop protection or preservation and set the limits according to the average minima of good practice is to ignore the real danger that may be involved.

As to class (3)—incidental contamination in processing or packaging—this largely involves metallic invasion, and the food industry today can choose from such a wide range of plant and packaging materials that risks of this kind can be reduced to insignificance. Legislation should most stringently protect consumers from this type of toxic hazard, for in any practical sense it is an avoidable one. Occasionally the use of a new material or of an older one in fresh circumstances may bring about a new and unforeseen danger. Thus, an official analyst recently reported that iced lollies were contaminated with lead chromate as a result of this substance being used as the pigment in the yellow printing ink on the transparent wrapper. Whereas with classes (1) and (2) it is a valid argument that minor risks of contamination can be balanced against large risks of food loss in cropping and distribution, there is no similar argument for

class (3). If some ancillary material used in processing or packaging is accidentally causing toxic contamination, another material must be chosen instead, or means of preventing the contamination— e.g., the use of protective lacquers in tins— adopted.

The risks of class (4)—the introduction of substances to increase colour or flavour—are bound to be considered controversially. How far should this kind of 'food fortification' be regarded as ethical or moral? Even the completely harmless additive will be regarded by many people as a form of deception. The dyeing of kippers and smoked haddocks has been frequently condemned. On the other hand, the natural colour of margarine is white, and it would never have achieved its extent of acceptance as a substitute for butter had it not been dyed to resemble butter. Is such a practice unethical? The nutritional contribution of margarine has been essential to most countries, not only in wartime but in peacetime also. Should this contribution have been restricted by making margarine-dyeing illegal? In the United States this course has been followed, but it has been the pressure of the milk and butter industry and not public sensitivity about the ethics of food-colouring that has kept margarine white, and only in very recent years — when the price of butter has jumped outside the easy range of some income groups—has margarine consumption in the US followed the expanding course of other countries in this century. How far should food processors add chemical substances to natural materials in order to give the public what is most desired?—that is the issue in the simplest terms. It is best exemplified by the case of white bread. Not only must the darker components of grain be removed mechanically but the persistent residue is bleached and 'improved' by chemical agents such as chlorine dioxide or nitrogen trichloride (Agene). This in fact may not be a public service but it is what the majority section of the public demands to be done.

There should be little doubt in the mind of any sensible person that the risks of this fourth class of 'food contamination' cannot be collectively discussed. Ethically, different cases cannot always be sorted out as 'good' or 'bad.' Some, indeed, will fall most obviously into the latter group as means of making inferior food appear to possess merits that in fact are absent. But many cases will fall into the no-man's-land between reasonable virtue and gentle deception, and who is to judge where the line of proper public policy should be drawn? Each case, then, must be assessed on its own merits and circumstances. Beyond ethical judgment comes the more factual toxic judgment. If chemical additives of this kind are permissible ethically, they must certainly not bring toxic risks with them; here the sanctions of the law should be very stringent. All-embracing legislation is not possible, for such a variety of foods and additives is involved, and the use of a specific additive may be ethically sound in one case, where in another it can be condemned. Negative and selective legislation that makes specific and bad cases illegal would seem to be the proper policy in any soundly administered country. Nevertheless, this principle is most difficult to apply for it can be made to seem invidious and in consequence assume the exaggerated shape of a threat to public freedom. The toxic risk is the only firm base for easy legislative control.

This leaves the fifth class—nutritional enrichment. In many ways this is a new class for its possibilities have been greatly enlarged by the development of manufactured synthetic vitamins. Additive practices in this class should not be prejudiced by the doubts and criticisms that hover above the additive practices and risks of the other four classes and, by contrast, legislation for this fifth and fortifying class might well be encouraging. At present the producers of foodstuffs which can desirably be fortified can choose whether or not they perform this service to the community; this is broadly true if it is not an accurate generalisation. This option is therefore mainly influenced by public awareness of nutritional science. It is essential that a public opinion that distrusts 'all these chemicals that get into food today' should distinguish between, say, the residue from an insecticide, and the trace addition of a mineral or synthetic vitamin.

Notes & Comments

A Chemical Centenary

THE anniversary of the birth of a man who was not trained as a chemist but whose influence upon modern chemistry was exceedingly powerful has been celebrated recently in America. He was George Eastman, who at the age of 23 was a humble bank clerk. Photography was the stimulus that brought his latent chemical talents to the surface; only three years after buying his first camera he had invented a dry plate and started a business to manufacture it. This was achieved without scientific education and through spare-time experiments in the kitchen. A few years later he began new experiments on paper films coated with emulsions and before he was 35 the first Kodak camera was on the market, the pioneer of non-cumbersome cameras. Unlike many inventors Eastman reaped the financial benefits of his work: unlike many successful business-men of his time he ploughed back his profits with an almost incredible faith in scientific progress. He employed research workers with a determination that is often lacking even today. Nothing succeeds like success and Eastman's bold outlook took him speedily into the multi-millionaire class. Having virtually shaped the modern photographic industry he became one of the most liberal patrons of science that the United States has ever known. He gave away millions of dollars, usually with the most modest anonymity. A gift of $20,000,000 to the Massachusetts Institute of Technology was for years known simply as the donation of a Mr. Smith. He endowed universities and set up dental clinics in Europe as well as in America.

The Eastman Kodak Service

HIS great service to chemistry was to establish an organic chemicals branch within the framework of the Eastman Kodak business. This was done at a time when there was little organic chemical research in America and when an organic chemicals industry was practically non-existent. By providing a commercial source for the supply of chemicals for organic research Eastman made both research and commercial development possible. The great value of the Eastman Kodak chemical service is still outstandingly apparent today in the United States as any reader of American journals' advertisement pages can readily appreciate; the more unusual chemicals and indications of their potential applications are constantly described in advertisements that might better be defined as attractively written research reports. It is impossible to estimate just how much George Eastman started besides making photography a simple hobby for the man in the street. In the words of a recent leader in *Chemical & Engineering News* 'he made it possible for thousands to be trained in chemistry and his impact on this particular branch of the natural sciences has been of great order of magnitude.' The age of men like Eastman has no doubt passed for ever. Ceilings are placed upon personal fortunes and benefaction on a large scale is out of date. It still remains to be seen whether the great corporations and the scientific organisations of the State can influence the pace of progress as effectively.

Putting U in the Picture

ALTHOUGH there is news every so often about uranium finds in Australia, comprehensive information about this addition to Australia's industry has always been scanty. A short but fact-filled account has been given in the *Atomic Scientists' Journal* (1954, **3**, [6], 341). Conditions are similar to those in prospecting for other minerals, except that development progress must satisfy the authority or the lease of land must be surrendered, and that uranium ores found must be sold to the Commonwealth Government. Uranium prospecting 'down under' is therefore quasi-nationalised, with the risks handed out to private enterprise and the successes fairly rigidly controlled. However, the theoretical harshness of this system is

softened considerably by official advisory services and by the government financial assistance which is given in some cases. The price at which Australian uranium is sold by the Commonwealth Government is unknown and this is a subject of much current controversy. It is generally believed that about two-thirds of production is sold to the US and one-third to the UK. Press and parliamentary pressure to have the price disclosed has so far been ineffectual. The result is a wide suspicion that the price is too low, much lower than the 30s. 6d. a unit which Canada is securing. There would seem to be little evidence of a general boom for prospectors or for speculators. A find reported by one company in late 1953 took the shares up from 2s. to 28s. in a few days; a few days later the price had dropped to 16s. 6d. Further reports about the discovery raised this to 22s. 6d. over the next fortnight, but a month later, with progress bulletins adopting a less certain tone, the price was down to 9s. 3d. These are dangerous fluctuations for speculators.

Topic of Cancer

MEETING in Sao Paulo, on the Tropic of Capricorn, 1,200 delegates from 46 countries have been discussing the topic of cancer. They heard Professor E. Boyland, Professor of Biochemistry at the Chester Beatty Institute, rival Ajax in his defiance of retribution; *all* synthetic foods, maintained Professor Boyland, are suspect and should be thoroughly tested. Unfortunately, this is only too true. While cancer chemists on the one hand laboriously approach the conclusion that cancer's primary cause is the replacement of an essential metabolic intermediate —nucleoprotein or steroid—by another substance whose chemical structure is sufficiently similar to deceive even the body; so on the other hand food chemists laboriously approach their goal of synthetic food colours and preservatives so similar to the natural products that even the body is deceived. Already *p*-dimethylamino-azobenzene and thiourea have been banned in most western countries—undoubtedly the mutual advances of cancer research and food chemistry will result in the banning of many more. Which will advance the more rapidly is not in doubt; we can only hope that part of the greater facilities and funds of the manufacturers of food chemicals will be devoted to the most stringent tests of their products, and the most cautious evaluation of results.

Sir John Cass Courses

THREE courses of great interest to chemists are announced for the coming year by the Sir John Cass College, Jewry Street, London, E.C.3. 'Statistical methods in scientific and industrial research,' by Dr. A. J. Feuell, is of particular importance to those concerned with the design of pilot plant or biological experiments. The course will consist of about 20 lectures, on Monday evenings, at 6.45 p.m., beginning 27 September.

Spectrochemical analysis is the subject of the course of 12 lectures by A. S. Nickelson, on Fridays from 6 to 7 p.m., beginning 1 October. It will be based on techniques of emission spectroscopy, and a laboratory course in both emission and absorption spectroscopy will be arranged to suit students' requirements. Eight lectures on radiochemistry and radioactivity will be given by Dr. A. G. Maddock, of the Radiochemical Laboratory, University of Cambridge, on Tuesday evenings at 6 p.m., beginning 5 October.

Copies of the syllabus and details of fees may be obtained from the Secretary of the College.

IN THE EDITOR'S POST

Cadmium Metal Theft

SIR,—We should be grateful for space in your journal to make an appeal to any of your readers to whom it is relevant.

It has been our unfortunate experience to have had stolen from our works a rather large quantity of cadmium metal. We believe that such an occurrence in the trade is not unique, and it would be of interest to us to learn from any other victims their success or otherwise in tracing the goods and/or the miscreants.—Yours faithfully,

D. H. JACK.

Metalin Ltd.,
Bletchley, Bucks.

Recovery of Aromatics with Liquid Sulphur Dioxide

by PETER W. SHERWOOD

TWO different purposes are served by the recovery of aromatics from petroleum fractions. The aromatic concentrate itself has value as aviation gasoline blend or, after isolation of its components, as chemical raw material. At the same time, greater value is imparted to the de-aromatised fraction as high-grade diesel fuel or improved catalytic cracker feed.

In recent years, growing emphasis has been placed on the concentration of aromatics for their own sake rather than for removal purposes. Various processes, such as extraction with aqueous glycol solution (Udex process), or adsorption on silica gel, have gained commercial acceptance. Growing importance now attaches to extraction with liquid sulphur dioxide for the recovery of high-purity aromatic concentrates.

The use of liquid sulphur dioxide as solvent for aromatics is, of course, not new. It has been practised for some thirty years for the removal of benzenoid hydrocarbons from paraffinic stocks, such as lube oils. No attempt was made in the older extraction processes to yield the sharp separation by type which is now called for in the recovery of aromatics for their own sake. Adaptation of sulphur dioxide extraction to this function is perhaps a natural development; but it has required fundamental changes in processing technique.

Successful Modification

Thus, much interest has been aroused by the successful start-up this summer of Continental Oil Company's new aromatics recovery facilities at Lake Charles, La. Here, a novel modification of sulphur dioxide finds application in the high-yield recovery of benzene and toluene-xylene fractions in good purity. From a daily feed of 3,570 barrels catalytic reformate, Conoco obtain benzene in 98.4 per cent yield (300 bpd.) and toluene-xylene mixture in 99.7 per cent yield (1,330 bpd.). The novel feature of Conoco's process is a single-tower countercurrent wash given to the saturated extract (in SO_2) phase by a heavy paraffinic fraction. Details of this method will be discussed below.

This, however, is only one of several devices for rendering sulphur dioxide extraction an efficient means for aromatics recovery. Three fundamentally different approaches may be made to achieve this same objective:

1. Extraction of suitable fractions by treatment with liquid sulphur dioxide at very low temperatures (down to $-60°$) gives an increase in selectivity. The two drawbacks of the method are the need for considerable refrigeration, and the decline in yield of aromatics since solubility of the desired components drops together with that of the paraffinic constituents.
2. Selectivity may be raised by sulphur dioxide with a light paraffinic hydrocarbon (propane or butane).
3. Selectivity may be raised by subjecting the extract to a backwash with paraffinic hydrocarbon boiling considerably above or below the desired aromatic fractions and thus permitting ready separation by subsequent distillation.

Commercial Developments

Methods (1) and (3) have found commercial application in the production of aromatic concentrates. In particular, method (3), involving backwash with a heavy paraffinic hydrocarbon, is finding current favour because of its suitability for high-yield recovery of very pure aromatic hydrocarbons. This is the approach selected for Conoco's new plant. Variants of it have also been operated by Anglo-Iranian Oil Company (at Abadan, Iran) and at Humble Oil and Refining Company's Baytown, Texas, refinery.

Earlier installations at both of the latter plants used straight low-temperature extraction by liquid sulphur dioxide (Method 1) for the production of aromatic concentrates to be used as aviation gasoline blends.

This single-step extraction can give a very pure aromatic product by operating at extremely low temperatures. This approach is feasible with hydrocarbons in the gasoline range, while it is defeated for heavier fractions by the highly viscous systems encountered in low-temperature operation.

The selectivity of sulphur dioxide extrac-

tion increases markedly as the temperature is lowered. Thus, single-stage extraction at different temperatures of a typical 143° fraction yields the following percentage by volume of aromatics in extract (SO_2-free basis)[1]:

Extraction Temp., °C.	Vol. per cent Aromatics in Extract
−18	69
−29	76
−40	82
−51	86

By multistage operation and proper adjustment of solvent ratio, it becomes possible to raise aromatics recovery and purity above the single-stage equilibrium values stated above. It is, however, at once evident that, in simple extraction, aromatics of high purity (97 per cent) can be obtained in a reasonable number of stages only by operating in the range of −50°. In such conditions, the raffinate may be depleted to an aromatics content as low as 0.5 per cent. Product purities of approximately 99 per cent are readily obtainable.

Terres[2] has traced the effect of three countercurrent stages in sulphur dioxide extraction at −60°. Feed was hydrocarbon fraction of 100-175° boiling range, and analysis 18.5 per cent $^v/_v$ aromatics. Solvent ratio was 75 volumes liquid SO_2: 100 volumes hydrocarbon. This system yielded the following extracts:

Stage	Composition of Raffinate		Composition of Extract	
	Per cent Aromatics	Per cent Non-Aromatics	Per cent Aromatics	Per cent Non-Aromatics
I ..	1.5	98.8	58	42
II ..	6	94	73	27
III ..	12	88	93	7

In this case, 18 volumes end extract and 82 volumes raffinate were obtained. Before stripping, the end extract contained 54 volumes of the total 75 volumes sulphur dioxide fed to the system.

Apart from temperature effect, the efficiency of simple SO_2 extraction is influenced by the molecular weight of the feedstock. At a given set of operating conditions, selectivity declines markedly with decrease in molecular weight of the feedstock.

In a typical simple SO_2 extraction the feed hydrocarbon is first dried and desalted. It is then cooled, first in exchange with raffinate leaving the extraction stage, and finally by propane or ethane refrigeration. Having attained treating temperature (say −60°), it is introduced to the extraction tower at a point near the bottom.

Solvent is taken from storage in the recovery system and is blended with make-up sulphur dioxide. Its path to the top of the extraction column leads via coolers, first in exchange with extract, and finally with external refrigerant.

Two phases are withdrawn from the packed extraction column. Leaving the bottom is the extract, a sulphur dioxide solution rich in aromatics. After heat exchange with incoming solvent, the extract is freed of SO_2 in a four-stage evaporator. The stages are operated at 200 psi., 80 psi., atmospheric pressure, and moderate vacuum respectively, so that the vapours of each stage can give up their heat of condensation to the boiling liquid in the following stage. Vapours leaving the last two stages are recompressed to 80 psi., at which pressure condensation is possible by water cooling.

Because of the particularly critical need for maintaining a water free system in low-temperature extraction, at least one commercial plant routes part of the high-pressure SO_2-vapours via a drying column. Here, sulphur dioxide is taken overhead and contained moisture is removed as bottoms. The column is operated at 80-100 psi. to permit water condensation. By the use of this drying column, it becomes possible to maintain a moisture content of less than 0.05 per cent $^v/_v$ in the sulphur dioxide circuit.

Sulphur Dioxide in Raffinate

Removal of sulphur dioxide from the raffinate leaving the top of the system's extraction column follows substantially the same scheme as outlined above for the extract. Because of the smaller quantities of solvent found in this phase, it is feasible to operate with only 2-3 evaporator stages. It is therefore usual practice to do without the high-pressure stages which are provided for treatment of the extract.

In the system here considered, the feed phases to the extractor receive their final chilling from an external refrigerant. This approach is currently favoured over the older auto-refrigerant use of sulphur dioxide itself by operating at the solvent's boiling point. The relatively small increase in capital investment occasioned thereby is well compensated for by the greater freedom provided by independent control of operating temperature, and by the independence of the recovery system from extractor pressure.

Concomitantly with a highly aromatic

extract, a valuable raffinate is obtained in the process. This phase contains up to 98-99 per cent raffinate and naphthenic hydrocarbons. In the case of medium fractions, it is therefore a high-quality diesel fuel. More recently, gas oil raffinates have been used advantageously as improved catalytic cracker stock.

Backwash Methods

Processing costs rise rapidly and plant throughput drops as the operating temperature is lowered. In modern installations, advantage is therefore taken of a process variation which allows highly selective operation in a more moderate, and therefore more economical, temperature range. In this method, naphthenes and paraffins contained in the extract are displaced by contacting the latter phase with a very light (propane-butane) or fairly heavy paraffinic fraction (kerosene, etc.). The result is an extract containing aromatic constituents in a boiling range which differs substantially from associated paraffins and naphthenes. After such pretreatment, it is therefore possible to separate the hydrocarbon types by simple fractional distillation or by azeotropic means.

The effect of this operating method on selectivity is strikingly illustrated by the single-stage extraction of a naphtha fraction at different temperatures, with and without backwash.

	Per cent v/v Aromatics in SO_2-free Extract		
Extraction Temp.	Simple Extraction	Extraction followed by Kerosene Backwash	and Distillation
−10	45		61
−20	57		73
−30	67		83
−40	76		91
−50	83		—
−60	87		—

In this instance, then, it is possible to obtain results at −37° with backwash, which call for an operating temperature of −60° in simple extraction.

This version of sulphur dioxide extraction has found application at Abadan for the production of a 95 per cent $^{w}/_{w}$ aromatics concentrate in the light naphtha range[4]. The primary extraction takes place in the normal fashion with 50-75 per cent $^{v}/_{v}$ sulphur dioxide at −30°. The primary extract is contacted countercurrently with kerosene in a washing tower 7 ft. dia. by 100 ft. high.

The heavy phase (secondary extract) leaving the washing column is freed of sulphur dioxide in three-stage evaporation. Fractionation of the extract oil in a 23-plate column suffices to recover a 95 per cent aromatics concentrate.

The secondary raffinate (i.e. the light phase leaving the kerosene column) is freed of dissolved SO_2 in 2-stage evaporation. The oil is split in a fractionating column, yielding an overhead of 35 per cent aromatics content which is blended with the feedstock to the primary extraction unit. The kerosene fractions, recovered as bottoms from the distillation of both secondary extract and raffinate, are joined and recirculated to the extract washing tower.

In a typical performance, this process yielded the following composition and yields:

	Light Naphtha Feedstock	Extract	Raffinate
Composition:			
Aromatics ..	16.7	75.9	1.3
Paraffins ..	54.5	14.2	63.2
Naphthenes ..	28.8	9.9	35.5
Recovery:			
Aromatics ..	100	93.8	6.2
Paraffins ..	100	5.6	94.4
Naphthenes ..	100	6.8	93.2

Simplifying improvements have been made since the construction of Abadan's unit, which permit combination of the primary extraction and the backwashing steps into a single operation. The plant now taken on stream by Continental Oil Company for the recovery of chemical-grade aromatics from a platformate introduces the light feedstock at the centre of the extraction tower. Sulphur dioxide is fed to the top, and wash oil is charged at the extractor's bottom. As a result, only a single raffinate must be worked up, where two raffinates were obtained in the older design. Either method yields, of course, only one extract phase.

A process of this type has been piloted by Stone & Webster Engineering Corp. Using as feedstock a platformate of 51 per cent aromatics content, the indicated solvent rate per 100 volumes charge was 170 volumes liquid SO_2 and 75 volumes wash oil. Extract temperature was −30°. This yielded a raffinate containing 1.8 aromatics and an extract assaying 94.0 per cent aromatics. Aromatics yield in the concentrate was 98.4 per cent.

For application to Continental Oil Company's new unit, the same basic concept has had to be expanded. This plant is operated for the production of chemical-grade aromatics, and therefore calls for 98.5 per cent

or better purity. SO_2 extraction with backwash is therefore supplemented by azeotropic distillation of the extract, using methanol as entrainment agent.

A typical charge to this plant is a depentanised light platformate fraction containing 10.7 per cent benzene, 31.3 per cent toluene, and 4.5 per cent C_8 aromatics (i.e. total aromatics content of charge is 46.5 per cent). This feedstock is inhibited with 1-2 lb. di-*tert.*-butyl-*p*-cresol per 1,000 barrels to prevent resin formation in storage.

En route to the extraction tower, the reformate is first dried by passage through a bed of activated alumina. Upon being cooled to $-32°$, it enters the mid-section of the ring-packed extraction tower which is operated at 5.5 psi. and near $-30°$. At the top of this tower, liquid sulphur dioxide is introduced, and wash oil is fed to the base at $-30°$. Daily rates of feed, SO_2, and wash oil are 3,570, 5,500, and 2,500 barrels respectively.

1,875 bpd. light hydrocarbon raffinate is formed. This material leaves the top of the extraction tower together with 275 barrels SO_2 and 2,335 barrels wash oil. The phase is raised to 50° in heat exchange with the charging stock. Via additional waste heat exchangers, it enters a 20-plate sulphur dioxide tower, operated at SO_2-condenser pressure. The hydrocarbon bottoms are fractionated in a second tower to yield raffinate overhead and recycle wash oil in the bottoms. The recovered raffinate contains only 0.5 aromatics and 2.0 olefines; the remainder are paraffins and naphthenes.

Sulphur Dioxide Recovery

The extract leaving the extractor bottom is raised to ambient temperature in heat exchange with incoming wash oil and sulphur dioxide. After further heating, this phase enters the first of two sulphur dioxide recovery towers, operated at 200 and 80 psi. respectively.

Following SO_2 removal, the aromatic extract is topped off from the associated wash oil. The heavy hydrocarbons contain practically all the aromatic components introduced with the original wash oil. This stream is therefore not used for further extraction but is returned to the refinery.

The light aromatic concentrate, taken overhead in the extract splitting tower, must be further purified to satisfy the demands of the product's chemical end use. The first step is distillative separation of benzene from the higher-boiling components in standard fashion.

Paraffins, olefines, and naphthenes associated with product benzene, are removed overhead in an azeotropic distillation with methanol. The make, withdrawn from the still base, is water-washed and is then of satisfactory purity (99.0 per cent) for the plant's purpose, which is the ultimate production of detergent-grade alkyl benzene. To obtain nitration-grade benzene, an after-treatment with sulphuric acid or clay would be required. Methanol is recovered from the extract's hydrocarbon impurities by a wash water, followed by rectification.

The use of a wash oil fraction of medium molecular weight (kerosene range), here practised, offers good advantages for the recovery of benzene and toluene. There is sufficient boiling-point spread between solvent and plant product on the one hand, and between product and wash oil on the other, to permit ready distillative separation.

Use of Light Paraffins

Still in the development stage is the use of light boilers (propane or butane) as wash oil. Propane, used as auxiliary solvent to sulphur dioxide, is capable of yielding very pure aromatic concentrate. One approach is to blend propane with the liquid sulphur dioxide before it is fed to the extraction column. By operating at $-30°$ to $-40°$ purity well above 95 per cent may be obtained in the extract. But even better purity, and certainly better recovery, can be achieved by backwashing an SO_2-extract with propane, much in the manner employed commercially with a higher-boiling wash oil.

Operating in this fashion, Terres[2] was able to obtain a substantially pure aromatic extract, with very low aromatic retention in the raffinate. His starting material was a heavy gasoline fraction, assaying 57 per cent aromatics. Careful fractionation of the extract showed approximately 5 per cent benzene (together with very little cyclopentane), and 50 per cent toluene. The balance was a mixture of xylenes together with some cumene and methyl ethyl benzene.

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Indian Newsletter

FROM OUR OWN CORRESPONDENT

A NEW company, Amar Dye-Chem Ltd., has been formed in Bombay for the manufacture of dyes of the naphthol series, fast bases, stabilised azoics and the necessary intermediates. Some of these will be imported initially. The consent of the Government of India and a licence have been obtained for the formation of the new company, which will have an authorised share capital of Rs. 10,000,000 (£750,000). The company will have a modern factory at Kalyan on a 50-acre site. An agreement has been entered into with Hilton-Davis Chemical Company, Cincinnati, Ohio, according to which the US firm will supply formulae, specifications, technical and patent information to the new firm and also make available results of researches conducted in their own laboratories in America. The use of the trade mark rights, names and brands has been authorised to the Indian firm. Hilton-Davis will have financial participation and representation on the board of directors. It is learnt that negotiations are in progress for the starting of new chemical industries in Bombay in collaboration with some English and American interests.

* * *

A new caustic soda plant may be set up in Indore with an estimated Rs. 6,000,000 (£450,000) capital, of which about half is expected to be spent on the purchase of machinery and equipment from abroad. The approval of the Government of India for this proposal has been obtained. The new caustic plant will be the first in that region and will have a capacity of 11.25 tons per day of caustic of rayon grade and of 99 per cent purity. It may be mentioned that production of rayon grade caustic is limited in India and is at present being manufactured by Travancore Cochin Chemicals Ltd.

* * *

It is reported that a white stone quarry in the vicinity of Chota-Udepur, about 65 miles from Baroda, contains radioactive deposits, believed to be composed of uranium minerals. After tests on the spot by nuclear energy experts, specimens have been taken for further examination and analysis. According to the Geological Survey of India, deposits of monazite have been found on the beaches of Andhra State. The survey is to conduct tests to assess the extent of the deposits. X-ray studies on Indian monazite are in progress on behalf of the India Atomic Energy Commission at the Central Scientific and Industrial Research Laboratories in Hyderabad. It may be pertinent to recall here the recent statement by the Deputy Minister for Natural Resources and Scientific Research of the Government of India that elaborate plans have been drawn up for research and prospecting of uranium and thorium in the country. It may also be of interest to note that, similar to the action taken in the United Kingdom, the Government of India have just constituted a separate Department of Atomic Energy with headquarters in Bombay. Dr. H. J. Bhabha, F.R.S., will be the secretary of the new department.

* * *

Detailed investigations by the Geological Survey of India over the last four years have revealed the existence of a total reserve of about 10,000,000 tons of lignite at Umarsar, Kutch. Though an earlier reference to thin seams of lignite in this area had been made, workable deposits gained prominence in view of the work on the Kandala port. At Umarsar, there is an uneconomic overburden of 100 ft. and the seams are not uniform, the bottom seam thinning out abruptly. It is thought that open-cut methods will not be feasible and underground mining has not been ruled out. It may be mentioned here that a small lignite mine at Bikaner is being worked by underground mining with a recovery of not more than 12 per cent. Meanwhile, the lignite project in Neiveli (Madras State) is progressing satisfactorily. A gas spout in the area has come to light and is being examined. Two mining engineers of Powell Duffryn have been made available under the Technical Co-operation Scheme of the Colombo Plan to study the mining of lignite in South India. They will stay for about six months and will submit a detailed report on all aspects of lignite mining and development to the Government of India.

The Indian Bureau of Mines, after investigation near Ramallakota (Andhra), have found evidence of a once flourishing diamond mining industry in the area. They recommend that a careful search for volcanic plugs, the original source of diamonds in Andhra, should be undertaken.

* * *

The Central Mineral Advisory Board at its recent meeting recommended the need to establish beneficiation plants for upgrading lean ores either singly or by co-operative endeavour and the desirability of establishing custom mills by State Governments. A sub-committee has been formed to examine the establishment of a ferromanganese plant in India and to report by 1 September. The need to develop copper, lead and zinc industries in India was stressed, as also the detailed prospecting of the country for hidden reserves. In this connection attention should be drawn to the two meetings held by the central and State Government representatives and the Geological Survey of India and the Indian Bureau of Mines in Srinagar and Bangalore, when a review of mineral prospecting carried out in India was made and detailed plans were drawn up for an intensive search for minerals in India.

* * *

Manganese ore mining operations have been suspended in many mines of Madhya Pradesh, Bihar and Madras, following a slump in the market for the past several months. The trade in export of the ore, which was in a boom period until last year, showed a downward trend. It is reported that there is severe competition from Cuba, Brazil, Africa and Russia. The impression which has been said to have gained currency abroad, that India is not keen on exporting manganese ore, has been repudiated recently by the Government of India. The Madhya Pradesh Mineral Industries Association and others have made representations to the Government to abolish the export duty on the ore, reduce railway freight, study foreign competition, set up a managanese marketing board and establish barter against capital goods. These and other measures are being examined by the Government.

* * *

The Government of India have accepted the main recommendations of the Indian Tariff Commission that the dichromates industry should be protected for a further period of four years from January, 1955, at the existing rate of duty of 31.5 per cent *ad valorem*. The protective duty will continue to apply to chrome compounds and the dichromates. The commission has made certain recommendations for rendering assistance to the industry.

* * *

A new plant belonging to Parke Davis Company for the manufacture of chloromycetin has been inaugurated in Bombay by the Minister for Health of the Government of India. This will be the first plant in India to manufacture the antibiotic. The company made a gift of 50,000 capsules of chloromycetin and some camoquin for distribution in the hospitals.

Fuel Efficiency Course

A RESIDENTIAL refresher course for works and plant engineers under the title of 'Fuel Efficiency as an Aid to Production' is to be held at the Clarendon Laboratory, Oxford, with accommodation at Brasenose College, Oxford, from 27 September to 1 October.

Eleven lectures will be given by experts in the special fields to be covered. They are: 'The Economics of Fuel Selection'; 'Combustion Control in Practice'; 'Instrumentation and Automatic Control'; 'Heat Storage and Peak Loads'; 'Heat Balances in Practice'; 'Compressed Air Appliances and Practice'; 'Design, Performance and Operation of Power Plant'; 'The Control of Power Factor and Maximum Demand'; 'The Diesel Engine and Waste Heat Recovery'; 'The Handling and Storage of Fuel'; and 'Fuel Efficiency in Europe and the USA.'

There will be opportunities for questions and discussions, and a visit will be made to an industrial concern. The Mayor of Oxford will welcome students, and the opening address will be given by Air Chief Marshal Sir Leslie Hollinghurst, K.C.B., C.B.E., D.F.C., chairman of NIFES. The closing address will be given by Lt.-Gen. Sir Thomas Hutton, K.C.I.E., C.B.E., M.C., of the British Productivity Council.

Application forms and a brochure giving full details of speakers and lecture contents can be obtained from the Secretary to the Course, Southern Area, NIFES, TOB 11, Whiteknights Park, Earley, Reading.

Foam Methods for Gas-Liquid Interaction

A Brief Description of Recent Russian Work

The following article is a condensed translation of a recent Russian paper. Readers who are familiar with modern Western designs of gas-scrubbers and fractionating columns will appreciate that we publish it as an example of current Russian Research, not as a revolutionary development in technology.

PROCESSES of physical or mechanical interaction in the gas/liquid system are of increasing interest and importance in many branches of industry in connection with absorption and desorption of gases, heat exchange between liquids and gases in direct contact, wet cleaning or scrubbing of gases, etc. They may be divided into three main groups; (a) mass and heat transfer by films in towers or columns, surface absorbers, cascade and other apparatus, ensuring contact of liquid films with gas; (b) transfer by dropping or trickling in apparatus with pneumatic or mechanical sprayers; and (c) bubble transfer by the introduction of gas bubbles or continuous flow through a liquid film in cupola, sieve-plate, or other forms of apparatus. Some recent Russian work in the Leningrad Technological Institute (Lensovet) on the foam type is described by M. E. Pozin and others in the Journal of Applied Chemistry (*Zhurn. Prikladn. Khim.*, 1954, **27** [1], 12); the paper is prefaced by a brief review of earlier Soviet research in this field.

Optimum Hydrodynamic Conditions

In the present work, using a sieve-plate type of apparatus, the main object was to intensify foam action by improved design, optimum hydrodynamic conditions (including rates of gas flow and of moving film), and reduction of diffusion resistance or drag; using the kinetic energy of the gas to convert the gas/liquid system into a vigorously moving unstable foam to increase inter-phase surface and other favourable factors.

The movable foam is easily obtained by cross-flow of gas and liquid over the perforated plates so designed and disposed as to ensure relatively high rate of gas current. No special foam-former is used. Three types of gas/liquid dispersions may thus be obtained: (1) liquid layer on plate interpenetrated by gas bubbles or streams, where the greater part of the system is liquid, e.g. in bubbling; (2) semi-suspended layer of liquid as film or flow current intimately mixed with gas bubbles or stream, forming a moving foam system in which the chief element is gas; (3) mixture of gas and liquid suspended in the gas phase as spray of varying degrees of dispersion.

Increasing Rate of Gas Flow

The effect of increasing rate of gas flow w is considered. When this reaches 0.5 to 1.0 m. per sec., the disperse system is mainly of the foam type, and the bubbling zone is minimum. Rate of gas flow and structure of foam depends on thickness of liquid layer, extent of free part of plate and its thickness, and other factors such as size, shape and pitch or disposition of plate openings. Changes in foam structure, e.g. from relatively large micelles with low gas speed to the disappearance of these at high speeds, are described, together with gas volumetric efficiency and its expression in terms of s_G of liquid, gas, and foam.

Rate of gas flow over the whole section of plate or apparatus may increase from 0.7 to 4 m. per sec. under the right conditions, so that mass and heat transfer is much more intensive in the moving foam layer, with a certain amount of dynamic stability. This may be known as the foam method and apparatus—though in essence the apparatus differs little from that of the bubble type. However, a few small but important differences in principle or design are noted, and some discussion of k_{PD} (the Russian abbreviation for coefficient of useful work) with relevant formulae is included.

Single-plate and multi-plate foam towers are shown herewith—Figs. I and II. In the former chamber 1 is of rectangular or circular section, with a lattice or plate 2 which may be slightly inclined to facilitate liquid flow. The lower part of the apparatus 3 may be flat, spherical, or conical. Various kinds of plate may be used, in one piece or composite, firegrate type, slotted, etc. The apertures of the plate constitute 5 to 40 per cent of the section, according to the kind of

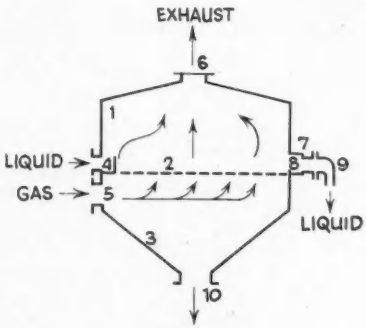


Fig. I

work to be done. Liquid is fed to the plate through inlet 4 and uniformly distributed thereover; while gas enters by diffuser 5 or through other suitable openings, the exhaust passing out through opening 6.

Rate of gas flow, according to need, is 1 to 3.5 m. per sec. Passing through the plate openings it contacts the liquid layer thereon, and a mass of foam moves in the direction of outlet 7 uniformly covering the whole surface of the plate to which baffle 8 is attached. According to the height of the baffle, the amount of liquid fed in and rate of flow of gas flow, the thickness of foam layer may be 35 to 550 mm., or even more. Some liquid of course may leak through the plate, but this may be desirable in some cases, e.g. in removing dust, etc., from gases. In this case the main bulk of dust is entrapped by small amounts of liquid and collects in the lower part of apparatus, from which it is removed through opening 10. A single plate foam apparatus for gas scrubbing has been described in detail in the authors' earlier work.

The multi-plate type (Fig. 2) is a tower or column with several sieve-plates one above the other. Liquid is fed as shown through a hydraulic seal or trap on to the upper plate, and moves along it as a layer of foam to the baffle or overflow where it disperses. From here the liquid passes through a hydraulic trap down to the next plate, and so on. The overflow for liquid and/or foam may be internal or external. Usually the external type is to be preferred, especially in relation to gas; but if the converse is the case, then internal overflow is better.

The ratio of liquid L to gas G may vary within wide limits, theoretically at least from zero to a maximum governed by the lowest rate of gas flow which will ensure formation of foam and maximum flow capacity of apparatus in relation to foam flow. Foam apparatus with sloped plates—in the direction of foam traverse—or of great width in relation to length, may operate with a volumetric ratio L:G reaching 1:50. Variations in working efficiencies of plates in relation to dates of gas flow are exemplified and graphed, using several models of foam apparatus with varying gas/liquid systems, sieve plate 1 to 25 mm. thick, aperture area 5 to 40 per cent, and holes or slots with diameters of 1 to 8 mm. Gas rates were 0.5 to 5 m. per sec. Height of liquid layer was varied by baffles or otherwise from 0 to 100 mm., and feed rate of liquid over plate was 1 to 70 cu. m. per hr. per 1 m. length of baffle. Changes in form and volume of foam formation with increasing gas speed up to maximum are discussed. At a speed of about 4.5 m. per sec. it was difficult to distinguish the foam zone from that of spraying, as the liquid passed from a semi-suspended to a suspended condition.

The rate of transfer of heat or mass from the gas phase to the liquid or the converse

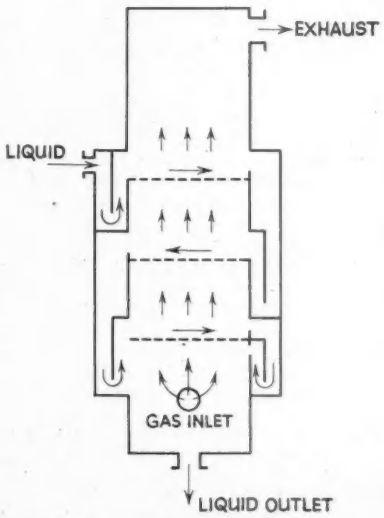


Fig. II

is graphed as coefficient K of processing rate, the relation to unit surface of plate. It is obvious that the value of K directly increases with speed of gas flow through the entire cross section of apparatus. The curve for hydraulic resistance or drag of the foam layer $\Delta\rho_2$ at all heights of the initial liquid layer h_0 has a specific maximum when w is 0.7 to 1.0 m. per sec., and a specific minimum with $w = 1.3 - 1.7$ m. per sec., according to the design and parameters of plate. Further increase in resistance at higher speeds of gas flow gradually slows down and then practically ceases. The curves therefore (Fig. III) show that the higher the rate of gas flow so much the more intense or vigorous is the performance of the apparatus and so much the less the expenditure of energy per unit of such intensity. However, increase of gas rate above 3-3.5 m. per sec. in many cases is not possible owing to excessive splashing or spraying losses.

It is concluded that properly designed and operated foam apparatus on the lines indicated offers wide possibilities in industry. In many cases a tenfold and even a hundredfold increase in rate of working is possible, with lower power costs. Despite its small dimensions in this type of apparatus it is possible to remove heat from the section space by fitting internal cooling units, taking up very little room and requiring only a minimum consumption of metal. This is due to the fact that the coefficient of heat transfer from foam to water flowing through tubes is many times greater than in the usual type of cooler.

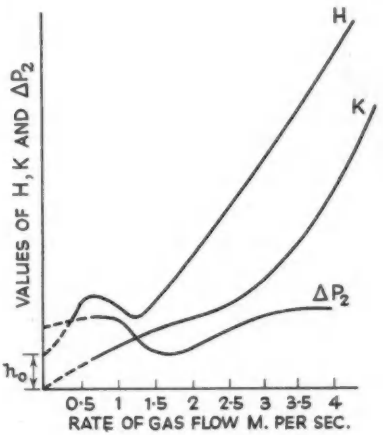


Fig. III

Relation between working efficiency of plate and rate of gas flow

Stainless Steel Firms Unite

TWO pioneer commercial producers of stainless steels, one British and the other Canadian, have just established a transatlantic liaison for exchange of information which is expected to further development in both countries. The companies are Firth-Vickers Stainless Steels Ltd., of Sheffield, England, which, as Thomas Firth & Sons, first commercially developed stainless steel in 1913, and Shawinigan Chemicals Ltd., of Montreal, through its stainless steel and alloys division, which is the largest and one of the oldest producers in Canada.

C. K. Lockwood, of Montreal, vice-president of Shawinigan Chemicals, in charge of the stainless steel and alloys division, said the agreement covers the exchange of technical information on all phases of foundry practice including melting, moulding, and heat treatment procedures. The Firth-Vickers firm operates the most extensive high-alloy foundries in the United Kingdom and has plants at Sheffield with complete facilities for producing centrifugal and large static-type castings, and near Birmingham where smaller type production is carried out. The work done by the company covers almost the entire range of foundry activity.

Technical development is carried on by Brown-Firth Laboratories, whose extensive laboratories form the main research centre for both the rolling mill and foundry operations. Shawinigan Chemicals' plants are at Shawinigan Falls, Que.

'The agreement with Firth-Vickers,' Mr. Lockwood said, 'will provide Shawinigan's stainless steel customers not only with the benefits of the latest and best of technical knowledge but also with an additional range of high alloy products which will be made available by the co-operative scheme. Stainless steel castings beyond the range of Shawinigan's facilities can be obtained from Firth-Vickers through Shawinigan.'

High Purity Hydrogen

From Liquefied Petroleum Gas

AS a result of the postwar petroleum refinery expansion programme, increasing supplies of liquefied petroleum gases (propane and butane) are becoming available in the United Kingdom and these gases can today be purchased at more economic prices than previously. This liquefied gas can be transported in bulk in tank cars and, as has been the practice in the US for some time, is a suitable raw material for the production of high purity hydrogen.

British Geon Ltd. are extending their plant at Barry, South Wales, and to carry out this extension they require an additional supply of high purity hydrogen. Hitherto, they have been producing hydrogen by the steam-iron process, for which coke is the raw material for generating water gas. British Geon have carefully considered the various processes for the production of high purity hydrogen and have come to the conclusion that the most satisfactory and economic process is to produce the hydrogen from petroleum refinery gas. A contract has been placed with The Power-Gas Corporation Ltd., Stockton-on-Tees, for the supply and erection at Barry of a plant to produce high purity hydrogen using liquefied butane as raw material. A hydrogen dehydration plant is included in the contract.

Very briefly, the process operates as follows: the butane, from storage tanks, is evaporated and mixed with steam and the butane-steam mixture is passed through a reforming furnace in which the hydrocarbon is decomposed into a mixture of hydrogen and carbon monoxide. Subsequently, more steam is added and the gas passed through catalytic reaction vessels for converting the carbon monoxide into carbon dioxide and hydrogen. The carbon dioxide is removed in a Girbotol plant, which employs an aqueous ethanolamine solution as the reagent. The product hydrogen is of 99.9 per cent purity.

The reforming furnace, which is manufactured under licence from the Hercules Powder Company, Wilmington, Delaware, incorporates a number of reaction tubes constructed of special heat-resisting steel and containing a nickel base catalyst. It can be heated by means of a fuel gas or fuel oil. The Girbotol plant and accessory equipment is to the design of The Girdler Company.

Chemical Import Controls

SALVADOREAN Decrees No. 1316 and No. 27, published in the Diario Oficial on 21 December, 1953, and 21 April, 1954, lay down that the import, manufacture and sale of certain chemical products is forbidden without a Certificate of Approval issued by the Salvadorean Ministry of Agriculture and Livestock. The products are: fertilisers, chemical and organic manures, rectifiers and all products for improving the fertility of the soil, insecticides, parasiticides, fungicides and repellent materials, for use either on animals or plants, patent medicines, serums, vaccines and other biological products for veterinary use, weed-killers and chemical and biological products for use with plants.

Application for the Certificate of Approval must be made in writing and should be accompanied by a sufficient quantity of the product for analysis and test, a complete formula and description of the method of use and a certificate of origin in the case of imported products, together with proof that its distribution has been authorised in the country of origin. In addition, patent medicines, serums, vaccines, etc., must first be registered with the Salvadorean Board of Chemistry and Pharmacy. Tuberculine and antigens for diagnosis of illness in animals may be imported only by the Ministry of Agriculture and Livestock.

Every chemical or bio-chemical product must show clearly in Spanish the following information: the name of the product and its manufacturer, the complete formula, its uses, dosage and the manner in which it is to be applied (except in the case of fertilisers, manures, etc.), the date of manufacture and the date of expiration in the case of products subject to deterioration, and any dangers inherent in the use of the product, precautions to be taken and antidotes in the case of poisoning.

Zirconium Research

Research to develop a less costly method of producing ductile zirconium is to receive increasing emphasis from the United States Bureau of Mines. By adapting the Kroll magnesium-reduction process for production of metallic zirconium and developing it, the bureau has brought down the cost of the metal considerably, but it is still too expensive for widespread commercial use.

Exemptions from KID

THE Treasury have made an Order under Section 10 (5) of the Finance Act, 1926, continuing from 19 August, 1954, until 18 February, 1955, the exemption from Key Industry Duty of all the articles (except phthalic anhydride) exempted from that duty by previous Orders with the addition of:

Tubing of neutral glass, not being (1) coloured glass or (2) glass with a content of more than 85 per cent of silica and boric oxide together or (3) glass of fused silica or fused quartz, in straight lengths having an external diameter of not less than 8 mm. and not more than 35 mm. and a wall thickness of not less than 0.3 mm. and not more than 1.5 mm., and being capable of passing a test corresponding with the test for limit of alkalinity of glass described by British Pharmacopœia, 1953; and diethylene glycol monobutyl ether, and with the deletion of:

Tubing of neutral glass, not being coloured or borosilicate glass, in straight lengths having an external diameter of not less than 8 mm. and not more than 35 mm. and a wall thickness of not less than 0.3 mm. and not more than 1.5 mm., and being capable of passing a test corresponding with the test for limit of alkalinity of glass prescribed by British Pharmacopœia, 1953; 2-monoaminoethyl alcohol; 2,6-diaminopyridine; 2-monodiethylaminoethyl alcohol; ethylene glycol carbonate; germanium dioxide; 2,4,5-trichlorophenol; 2,4-xlyenol; and L-xylose.

In the case of phthalic anhydride, the Order continues the exemption from Key Industry Duty only until 18 November.

New Insecticidal Lacquer

THE troopship *Dunera* recently left Southhampton docks for the Far East after it had been treated against insects by means of a new insecticidal lacquer. The lacquer, which was developed after three years of continuous research, contains the Shell insecticides, aldrin and dieldrin, and is covered by a British patent filed by the National Research Development Corporation, which is issuing licences for its manufacture.

The newly discovered lacquer is said to have the unique property of expelling the insecticides in minute crystals, an action quickened by the friction of insects crawling on the surface. Lethal properties persist for at least two years after application despite repeated washing and scrubbing.

Aldrin and dieldrin were developed comparatively recently by Shell, who are building a new £1,000,000 plant for their manufacture at Pernis near Rotterdam. They have been found dramatically successful in controlling a very wide range of insects in all parts of the world, notably locusts, seaweed fly and many agricultural pests.

The formulation of the lacquer is as follows:—

Urea Resin (Type B.C.555)	50 parts by wt.
Alkyd Resin (Type B.C.666)	50 parts by wt.
Butanol	27.5 parts by wt.
Xylole	22.5 parts by wt.
Dieldrin	12 parts by wt.
Aldrin	12 parts by wt.

The accelerator (sulphuric acid 10 per cent volume) is finally added to the above in the proportion of 1:20.

Spraying the galley of the troopship with insecticidal lacquer

Tees-side Developments

Report Surveys I.C.I. Factories

IT is difficult to envisage any fall in the long-term demand for chemicals, and the North East may continue to place the utmost confidence in the future of this great and expanding industry, says the 1953-54 report issued recently by the North East Industrial and Development Association. Dealing with industry in general, the report says that much of the ground lost in 1952 has been recovered, and manufacturing production is at present running well ahead of last year.

Main interest in the chemical industry in the North East, it says, continues to centre on the great developments which are taking place at the new I.C.I. works at Wilton. The vast scale of these projects may be gauged from the fact that capital expenditure to date has already exceeded £32,000,000, and construction activity is expected to continue for many years to come. Capital investment at Wilton in 1953 totalled nearly £7,000,000, while a programme involving the expenditure of about £10,000,000 has been planned for the present year. On the production side, no new plants were brought into use in 1953, but a new plant for the manufacture of chlorine and a second polythene plant came into operation during the first quarter of 1954; a phthalic anhydride and a 'Terylene' plant are expected to come into commission later in the year.

It is still too early to make any accurate assessment of the employment that will result from these and future projects, but the staff and labour employed at the Wilton works now totals over 4,000; this does not include a force of about 2,000 men at present engaged on construction.

The report adds that the newness and scale of the development at Wilton have meant, perhaps inevitably, that the I.C.I. factories at Billingham have received less than the share of publicity they deserve. This undertaking covers more than one square mile and employs over 16,000 people. Four I.C.I. Divisions operate factories at Billingham, the largest being the Billingham Division which controls four-fifths of the labour force.

Capital expenditure by this Division between 1946 and 1953 amounted to more than £18,000,000, and major projects which were brought into operation during this period included plants for the production of sulphuric acid, nitric acid, synthetic phenol, urea, amines, pure *iso*-propanol and acetone. Substantial extensions to ammonia and sulphuric acid capacity are at present in progress, together with corresponding extensions to the capacity for raising steam and electric power. Total output from the Billingham Division has continued to rise, and by the end of 1953 production had been increased by 33 per cent over the 1946 figure.

US Petrol Refineries

THE average petroleum refinery in the United States increased its capacity to process crude oil by nearly 1,500 barrels a day during 1953, according to a Bureau of Mines report released by the Secretary of the Interior.

Presenting results of the Bureau's annual survey of capacities at crude-oil refineries, including cracking plants, the report shows that throughput capacity at the average refinery was 23,759 barrels daily on 1 January, 1954, compared with 22,270 barrels daily a year earlier. Although the number of operating refineries dropped from 343 to 337 during 1953, total daily capacity rose from 7,638,661 to 8,006,897 barrels, an increase of more than 368,000 barrels.

Additional crude oil capacity totalling 397,500 barrels was reported under construction at the beginning of 1954. Accounting for 129,500 barrels of this total are facilities for new refineries, three in North Dakota, two in Washington, and one each in Ohio and Utah.

Materials Ministry Dissolved

FORMAL dissolution of the Ministry of Materials, and transfer of its functions to the Board of Trade, was completed on 16 August. The principal functions transferred are the management and custody of strategic stockpiles, and the disposal of stocks of materials in which public trading has been brought to an end. It is estimated that by the end of the year nearly 1,400,000 tons of these materials, at a value of about £125,000,000, will have been sold. The transfer has involved some administrative reorganisation at the Board of Trade, and two raw materials divisions have been established there, but with some rearrangement on the industries and manufactures side there will be a net increase of only one division.

Fixation of Nitrogen

Conflicting Results of American Work

DIRECT manufacture of nitric acid and nitrates from the air, that is, the fixation of atmospheric nitrogen, has exercised the ingenuity of the chemist and chemical engineer for many years with only a very small measure of success. The Birkeland and Eyde process which became obsolete soon after the turn of the century was the most successful attempt, and since that time considerable effort has been made to overcome the original disadvantages of the method, the most serious of these being the very high power consumption required by even moderate sized plants.

One of the most promising alternatives has involved the replacement of the inefficient electric arc by a reverberatory furnace. The furnace is used to heat a bed of refractory pebbles to 2,500° and air is drawn across this bed in such a manner that it is raised to the high temperature in a tenth of a second, maintained at that temperature for 3 seconds, and then immediately cooled in a tenth of a second. The nitric oxide so produced is used to make nitric acid and the process is being developed in the United States by the Wisconsin Alumni Research Foundation in conjunction with the Food Machinery and Chemical Corporation.

New Kind of Electric Arc

Just after the last war a series of patents taken out in the United States by Cotton claimed the invention of a new kind of electric arc which was to be used in the preparation of nitric oxide and hence nitric acid from the air. In the process described the air was passed between two pairs of electrodes, one pair connected to an AC power source operating at 2 kV, and 60 cycles, and the other to a radio frequency source operating in the range of 1 to 10 Mc. per sec.

The advantage of providing a low frequency and a high frequency discharge superimposed in the same tube is said to be that nitric oxide production can be carried out at much higher pressures approaching that of normal atmospheric pressure, while at the same time there are maintained within the tube conditions which are characteristic of glow discharges at much lower pressures. In effect, the Cotton process is an attempt to combine the relatively high throughput of the Birkeland and Eyde process with the higher yields and lower temperatures associated with the glow discharge. With much lower power consumption (one of the original Birkeland and Eyde plants used 350,000 HP) much higher conversion rates are claimed under quite favourable working conditions.

Critical Frequencies

A feature of the Cotton process was the high yields associated with certain critical frequencies, these frequencies being characteristic of the electrode material and of the reacting gas mixture. Those frequencies associated with the composition of the gas mixture (air) have been given the name of critical reaction frequencies, while those associated with the electrode material have been called critical electrode frequencies. The optimum pressure for the process was found to be 335 mm. of mercury. Where there is overlapping of the reaction and electrode frequencies the appearance of a compound peak in the graph of yield against frequency is claimed resulting in an improved overall yield of nitric acid from the air.

A recent paper (*Ind. Eng. Chem.*, 1954, **46**, 1468), while confirming the superiority of the crossed high frequency-low frequency discharge, has failed to confirm the existence of these critical frequencies with a small laboratory apparatus. In the experiments described air was allowed to flow through a glass tube in which were placed four conical copper electrodes spaced symmetrically. The application of 60 cycle AC to one pair of electrodes and 2 Mc. radio frequency power to the other pair produced within the tube a flat disc-shaped luminescent zone between the tips of the electrodes. This had the characteristics of an arc rather than a glow discharge and temperatures between 100° and 300° were measured inside the tube. The authors were unable to reproduce the work described by Cotton although significant enhancement of the yield of nitric acid from the air was obtained by the use of a crossed discharge.

The efficiencies of the process were cal-

culated in two distinct ways, on the basis of the yield of nitric acid per kWh and the utilisation of the available oxygen. The yields obtained varied from 2 to 9 g. per kWh at pressures between 100 and 300 mm. of mercury corresponding to power efficiencies from 0.083 per cent to 0.73 per cent and oxygen utilisation efficiencies of 2.4 per cent to 6.55 per cent. The combination of high frequency and low frequency discharges was always found to be more effective than either alone, and when the percentage of high frequency to low frequency power was varied maximum yields were obtained at 50 per cent and 20 per cent of low frequency power.

It was not found possible to provide more than 50 per cent of low frequency power because of overheating, and at pressures above 300 mm. of mercury considerable arcing took place. Nevertheless, by extrapolation at a pressure of 235 mm. of mercury it was estimated that the yield of nitric acid per kWh for the low frequency discharge alone would be 3 g. compared with a value of 0.1 g. for the high frequency discharge alone and 8.4 g. for the crossed discharge. These findings were in contrast to those reported by Cotton, who obtained a maximum yield at the higher pressure of 335 mm. of mercury with equal amounts of high frequency and low frequency power, the yield being greater by a factor varying between 5 and 15.

Despite these differences there is no doubt that the addition of a radio frequency discharge to the conventional arc as used in the old Birkeland and Eyde process considerably enhances the possibilities of the economic fixation of atmospheric nitrogen, more particularly so in localities where there are cheap sources of electric power. A great deal will depend, however, on whether the yield of nitric acid per kWh can be raised still further by the use of a more efficient discharge.—J.R.M.

To Open Uranium Plant

Australia's biggest uranium plant will be officially opened by the Prime Minister, Mr. Menzies, at the Rum Jungle uranium field on 17 September, when large-scale production of uranium oxide will begin. Output will be about twice as much as originally planned.

QVF Products on Display

Stands at European Exhibition

'VISIBLE Flow' glass pipeline and 'Quickfit' industrial plant in glass, marketed by QVF Ltd., of Stone, Staffs, will be exhibited on the stand of the firm's Belgian agent, IVIA, Louvain, at the International Technical and Industries Exhibition at Charleroi, Belgium, from 18 September to 30 October. The firm's products will also be on display, for the second year, at the International Machinery & Apparatus for the Food Processing & Chemical & Pharmaceutical Industries (Vochema) Exhibition in Utrecht, Holland, from 20 to 27 September. This exhibition is a showground for chemical and chemical engineering products manufactured in Western Europe, so that competition is very keen.

Full-scale Working Units

The QVF display, on the stand of their agents for the Netherlands, IVIA, Rotterdam, includes two full-scale working units. One is a large scale vacuum still with steam heated evaporation units having a total surface area of 4.8 sq. metres. The fractionating column is of 30 cm. diameter, surmounted by 30 cm. diameter reflux condensers and magnetically operated swinging reflux divider. The steam is provided by an electrode boiler. The other unit is an 8-litre capacity solid/liquid extractor of the soxhlet type with steam-heated solvent evaporator.

A test rig simulating operation demonstrates an all-glass pressure release valve. This unit is a safety valve designed for use with metal or enamelled metal vessels under corrosive conditions likely to prevent proper working of valves made in material less corrosion resistant.

The use which can be made of 'Quickfit' industrial plant in glass units is demonstrated by a 1/12 scale model of a large assembly. Of particular use to manufacturers of pharmaceuticals and fine chemicals is a 100-litre capacity reaction vessel which incorporates an immersion cooler. This has been designed specifically for chemical reactions which require heat to start them, followed by cooling to keep the reaction under control.

Some similar units will also be on display at Charleroi.

Crusilite

New Silicon Carbide Furnace Element

MANY years of research and development work have resulted in the production by The Morgan Crucible Co. Ltd., of Battersea Works, London, S.W.11, of a new and improved silicon carbide element for use in high-temperature furnaces which is being marketed under the name of Crusilite. This is a one-piece silicon carbide tube produced by a completely new method, in which the central hot zone is in the form of a spiral of the requisite length. It is entirely suitable for working over a wide range of element temperature from 800° to 1,575°.

Its rate of increase of resistance is relatively slow, with the result that it can be operated for very much longer without replacement than earlier types of silicon carbide elements. Being in one piece, it is also stronger and has no joints to fail. Such is the strength of the material used in its manufacture that a highly efficient terminal arrangement can be used. At present available for the 10 and 14 mm. diameter elements only, this consists of special metal terminal caps shrunk on to the metallised ends of the elements. The elements can be supplied with metallised ends only for furnaces where space is restricted and it is not possible to use the terminal caps.

No Strain on Elements

The terminal caps assure a good electrical contact on to the silicon carbide and also provide an easy means of connecting to the power supply. Two nuts are fitted to the threaded pillar which is an integral part of each cap. To connect to the supply it is only necessary to attach the flex or braid to the pillar and screw the outer nut on to it. If the inner nut is held by a spanner during this operation, the element cannot rotate and no strain is put on the element in any direction.

The method of manufacture of Crusilite enables the materials to be made over a range of resistance, and suitable resistance values are held in stock to cover the electrical conditions most frequently met in common practice. Despatches from manufacturer's stock will be within a tolerance of ± 10 per cent of the nominal, but the resistance of all elements supplied as a set for any particular furnace will not vary by more than ± 5 per cent of the mean.

Typical Crusilite elements with special terminal caps on the smaller sizes

Indian Essential Oils

A SYMPOSIUM on research and development in Indian essential oils and aromatic chemicals will be held at the Forest Research Institute, Dehra Dun, from 27 to 30 September, under the joint auspices of the Forest Research Institute and the Indian Council of Scientific and Industrial Research.

The symposium will be in three sections, devoted to original papers and reviews of research and developments in Indian essential oils, natural isolates, their derivatives and perfumes and resinoids; aromatic chemicals and flavouring materials; miscellaneous matters including standardisation of essential oils and aromatic chemicals, and their methods of tests and analysis; instruction and training in essential oils technology; place of essential oils in India's Five-Year Plan; marketing, export and import of essential oils; governmental policies and controls.

Besides the three sessions of the symposium, an exhibition displaying scientific literature, samples of essential oils, perfumes, aromatic chemicals, essences and allied products of Indian and foreign origin, technical and statistical charts, photographs and botanic and actual specimens of essential oil-bearing plants will also be arranged.

Meetings of the Essential Oils Research Committee of CSIR and the Essential Oils Sectional Committee of the Indian Standards Institution, and other related organisations, will be held in the same week.

Courses at Acton

A COURSE of 12 lectures on 'Industrial Applications of Biochemistry' will be held in the Department of Chemistry and Biology, Acton Technical College, High Street, Acton, London, W.3, on Wednesday evenings, starting on 29 September. The courses will be suitable for chemists and biochemists who are practising in branches allied to the biochemical field, such as food chemistry, agriculture, fermentation, and manufacture of chemicals of pharmaceutical and medical importance.

It will deal with fundamental biochemical principles—properties and functions of enzymes and vitamins, nutrition and principles of metabolism. Emphasis will be laid on application to industrial processes, including brewing, fermentation processes, food manufacture, vitamins in animal nutrition and food, animal feeding and agriculture and biochemistry in the pharmaceutical industry.

A special course of 12 lectures on 'The Modern Chemistry of Oils, Fats and Waxes' will be held on Friday evenings, starting on 1 October. This course will be suitable for industrial chemists, research workers, and others engaged in industries concerned with the extraction and refining of oils, fats and waxes and with their use in industry and commerce. Lectures will be given on 'The Composition of Oils and Fats and its Bearing on their Utilisation,' 'The Chemistry of Drying Oils,' 'Recent Developments in Methods of Analysis of Oils and Fats' and 'The Modern Chemistry and Analysis of Waxes.'

Revised Phenolic Standard

THE British Standards Institution has recently issued a revision of BS.771 'Synthetic resin (phenolic) moulding materials,' which was originally published in 1938 and the first revision of which was published in 1948. The present revision involves only small changes in levels of quality, generally towards higher quality.

The most important change is the introduction of a simpler statistical technique without loss of discrimination. One value, L, is specified against which is compared the average value of a specified number of test results on a single batch of material. Another value, X, is specified against which is compared the average value of the results derived from a sequence of batches. The values of L and X are given in the standard. A simple procedure is outlined for determining the specified value appropriate to any number of batches forming a sequence.

From the purchaser's point of view the advantage of this specification is that it gives an assurance that in a sequence of batches only occasional batches will be expected to have a quality equal to L and that over a period the average value will be at least equal to X.

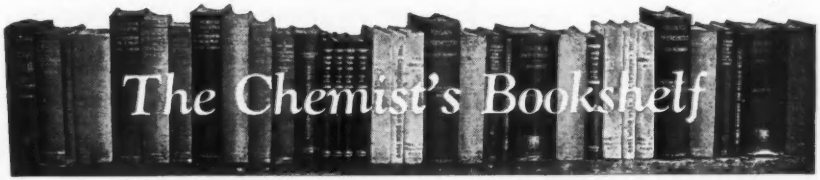
This issue of the standard includes cross-breaking strength as an additional requirement and the standard temperature for tests involving immersion in water is raised to 25° on the grounds of greater convenience.

This standard also prescribes for the following properties of eight types of phenolic moulding materials: impact strength, surface resistivity after immersion in water, volume resistivity, heat resistance, power factor, permittivity, tensile strength, water absorption, plastic yield, electric strength, acetone soluble matter.

Methods of test for each of the specified properties are given, together with methods of test for power density and bulk factor, flow properties, shrinkage of mouldings, density of mouldings, crushing strength, shear strength and elastic modulus in tension. Copies of this standard may be obtained from the British Standards Institution, British Standards House, 2 Park Street, London, W.1, price 6s.

Australian Claim Rejected

IMPERIAL Chemical Industries of Australia and New Zealand has rejected the Australian Council of Trade Unions' request for more pay for its 3,500 employees. The general manager, Mr. L. W. Weickhardt, said that the direct amount involved of £750,000 could not be offset by a foreseeable increase in manufacture, improved efficiency or at the expense of moderate company dividends. It had already been necessary to close one plant because of the non-competitive position with overseas supplies. The company believed that the overall influence on wage rates of national prosperity and productivity could only be assessed after searching arbitration by a Court of Inquiry. The unions had asked for a doubling of the marginal pay of the employees.



ARBEITSGEMEINSCHAFT FUR FORSCHUNG DES LANDES NORDRHEIN-WESTFALEN. Publication No. 31. Chemie und wirtschaftliche Bedeutung der Sulfonamide, by F. Mietzsch. Die experimentellen Grundlagen der Chemotherapie der bakteriellen Infektionen, by G. Domagk. Westdeutscher Verlag. Cologne and Opladen. 1954. Pp. 71. Paper, DM. 5.25.

The first of these two lectures, held in Düsseldorf under the auspices of a research association, is a concise account of the chemistry and development of the sulphonamides and certain related therapeutic agents. Synthetic details are included together with some discussion of the bearing of physical properties such as basicity and solubility on the therapeutic action. The lecture concludes with a brief survey of the economic importance of these substances. The effect of their development on the cost and availability of other chemicals such as chlorosulphonic acid and heterocyclic compounds is considered. Tables of quantities produced, consumed, imported and exported over a period of years in various countries are included.

The second lecture is by none other than Professor Domagk who was the first to use sulphonamides therapeutically. He gives a most authoritative and readable account of the experimental basis of the chemotherapy of bacterial infections with special regard to the sulphonamides, thiosemicarbazones and isonicotinic hydrazide, interspersed with frequent reference to the antibiotics. Streptococcal, staphylococcal, pneumoccocal and other infections are discussed, but particular attention is paid to the chemotherapy of tuberculosis. The view is expressed that rheumatism is caused by certain types of streptococcus established perhaps in teeth, tonsils or inflamed joints and that it may well prove possible to find suitable agents for successful chemotherapy.

The subsequent discussion by prominent chemists and medical men deals among other things with patent rights, genetics of resistant strains, aerosol treatment, mode of action of sulphonamides and isonicotinic hydrazide and tubercular meningitis.—M.C.

PHYSICO-CHEMICAL METHODS. Vols. 1 & 2. Fifth Edition. By J. Reilly and W. N. Rae. Methuen & Co. Ltd., London. 1954. Pp. 760 and 800. £7 10s. (both vols.).

Reilly and Rae is one of the best examples of the English style writing of textbooks. With only one or two authors it is possible to provide a completely coherent and connected exposition of a general subject, and it seems unfortunate that it is being superseded by the American or 'symposium' style. The latter involves the collection by an editor of a series of monographs, each written by a separate specialist upon a single aspect of the subject, and often leads to repetition and lack of a connected narrative. This process of replacement, however melancholy, may be inevitable, being the natural result of the rapid growth of knowledge in every subdivision of science. In a quarter of a century 'Physico-Chemical Methods' has grown from a single book to a set of three large volumes, and in the present (fifth) edition the revision has been extensive despite the fact that the previous revision was as recent as 1943. It is intimated in the preface that the increasing size of the text necessitates that future editions will be revised by a team of specialists and will assume the character of a symposium.

The two chapters which have had most drastic revision are those dealing with 'Low Temperature Technique' and 'Dielectrics,' but most of the chapters contain additional material and some have been completely rewritten. The chapter dealing with low temperature technique is now divided into four sections providing a very full account of the properties of freezing mixtures with tables of temperatures and instructions for their efficient use; the methods of attaining low

temperatures including both gas liquefaction and the twin techniques of adiabatic demagnetisation and desorption which can be carried out at temperatures very close to the absolute zero; low temperature thermometers; and the properties of substances at the temperature of liquid helium. In view of the commercial production of helium cryostats and the application of low temperature phenomena such as super-conductivity in the construction of bolometers of the very highest sensitivity, the full treatment which is accorded to the subject is most welcome.

In a similar fashion the chapter on dielectrics, which has been expanded into three sections, covers a field which has been given a great deal of attention in recent years. All the well-known methods of determining the dielectric constant of a substance are given in some detail, together with circuit diagrams of some of the instruments. The last section of the series lists a number of the applications of the measurement of dielectric constant. Considerable space is devoted to the calculation of dipole moments of chemical compounds and to the uses of the evaluation of the dipole moment in the investigation of chemical structure. Another aspect of dielectric constant measurement which is examined is its employment in the monitoring and control of processes. These may be physical processes such as occur in distillation or concentration or they may be chemical reactions.

It is a simple matter when criticising a work of this type to suggest the addition of fresh material or urge the rejection of earlier sections of the text, and in addition, the exact demarcation line between experimental procedure and laboratory technique cannot be clearly defined; but in this new edition there appears to be only one serious omission. When the subject of conductivity water is being discussed there is an ample description of the various distillation procedures which have been developed to produce water of very high purity. Many of these are extremely laborious and exacting, and no mention is made of the far simpler method using commercially available ion exchange resins. With a column containing a mixture of a strongly acidic and a strongly basic resin it is possible to produce water with a very low conductivity in a single pass under favourable conditions. Furthermore, it is possible to keep the water in this state by leaving it in contact with a small quantity of the strongly basic resin so as to remove any carbon dioxide absorbed.

As in previous editions there is no attempt to be completely authoritative, references are always made to the original literature at the bottom of each page, and there are suggestions for further reading in lists provided for each chapter. The bibliography is by no means complete, but the books and references quoted are those most pertinent to the subject and the lists are completely up to date. The new edition of 'Physico-Chemical Methods' must be most heartily recommended to all engaged in the practice of pure and applied chemistry.—J.R.M.

INORGANIC CHROMATOGRAPHY. By Orsino C. Smith. New York: D. Van Nostrand Company Inc. London: MacMillan & Co. Ltd. 1953. Pp. 134. 37s. 6d.

This book provides a useful account of the wide applications of chromatographic methods in inorganic separations and determinations. According to the author the book is intended primarily for the analytical chemist who is concerned with practical results and the methods by which they may be obtained. The discussion of chromatographic theories and mathematical formulae has consequently been kept to an absolute minimum. The former are briefly considered in the opening introductory chapter on chromatographic analysis. The second chapter—an account of the work of Tswett on adsorption analysis—seems to owe its origin to the fact that during his student period at the University of Missouri, the author was engaged, while assisting research work on the colouring matter of butterfat, in translations of Tswett's original papers.

The three main chapters of this work are devoted to a description of the chromatographic separation of inorganic compounds upon (a) adsorption columns, (b) paper and (c) ion exchange columns. A very short chapter contributed by John A. Bishop describes the use of radioactive tracers in chromatography. The final two chapters are devoted to the experimental technique used in inorganic chromatographic analysis, in which the advantages of various adsorbents are discussed, and a full description of an analytical scheme for the chromatographic separation of metals is provided. There are 168 references.—G.S.E.

HOME

Reclaimed Rubber

Production of reclaimed rubber rose to a weekly average of 810 tons in May this year according to the Monthly Digest of Statistics for July. Figures of weekly averages by months (1953 figures in brackets) were: January, 700 tons (540); February, 790 (590); March, 790 (630); April, 640 (500); May, 810 (680).

Ceramic Society Meeting

The autumn meeting of the Refractory Materials Section of the British Ceramic Society is to be held on Thursday and Friday, 11 and 12 November, in the Library of the Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1. Papers will be presented on casting-pit refractories, the bursting expansion of chrome-magnesite bricks, abrasion resistance, the sintering of magnesite, the catalytic conversion of quartz and the refractoriness-under-load test.

Distillers-Dow Agreement

In his annual report the chairman of The Distillers Co. Ltd., Sir Henry J. Ross, reveals that negotiations were recently concluded with the Dow Chemical Company of Michigan, to form a British company, under the title of Distrene Ltd., of which The Distillers Co. will hold 55 per cent, for the manufacture of polystyrene at Barry, South Wales, under the Dow Company's patents.

Telex for DCL Industrial Group

The new Devonshire House, London, offices of British Industrial Solvents, a Division of The Distillers Co. Ltd., have now been connected with the International Telex system and allotted the number 8739, call sign BISOLV. The service can also be used for communication with other members of the DCL Industrial Group now concentrated in Devonshire House and 21 St. James's Square, including British Geon Ltd., British Resin Products Ltd., The Carbon Dioxide Company, the DCL Industrial Alcohol Division, the DCL Engineering Division, Honeywill & Stein Ltd., F. A. Hughes Ltd., Magnesium Elektron Ltd., and The Methylating Co. Ltd.

Telephone Number Changed

The telephone number of the Head Sales Office of Hess Products Limited, 4 Albion Street, Leeds, 1, has been changed to Leeds 30194-5.

Phosphatic Fertilisers

A total of 26,700 tons of phosphatic fertilisers was produced in Britain in May. The figure was made up of superphosphates (13,300 tons), ground basic slag (5,000 tons), ground phosphate (2,600 tons) and other fertilisers (5,800 tons). Total production figures for previous months (1953 figures in brackets) were: January, 34,600 tons (35,700); February, 32,000 (32,000); March, 36,700 (42,900); April, 30,800 (35,100).

Extinguishers for Danish Air Force

Nu Swift Ltd. announce the receipt by them of the first order for their Chloro-Flash Extinguishers for use in the aircraft of the Royal Danish Air Force. The extinguishers are charged with the new, fire-fighting chemical, chlorobromomethane, which, mixed with carbon dioxide, is held under constant pressure.

Industrial Alcohol Production

Production of industrial alcohol in Great Britain in May was 2,810,000 bulk gallons against consumption of 2,500,000 bulk gallons. The production figure is the highest since 1950 and compares with 2,550,000 bulk gallons in April. The average monthly production in the first quarter of the year was 2,150,000 bulk gallons, as against 1,670,000 in the first quarter of last year and 2,120,000 in the second quarter.

Ukarb Price Changes

Wilfrid Smith Limited of 16 Philpot Lane, Eastcheap, London, E.C.3, announce modifications in the prices of Ukarb 327 (carbon black) which came into force last week. The new price range is: ten ton lots, 7¼d. per lb. ex works; five to nine ton lots, 8d. per lb. ex works, one to four ton lots, 8¼d. per lb. ex works; under one ton, 9d. per lb. ex store. Terms are nett cash seven days from the date of invoice, 50 lb. nett bags free.

• OVERSEAS •

US Mercury Offer

The US General Services Administration has made Mexico an offer to buy a large quantity of mercury over the next 2½ years at its buying price, $225 per flask of 76 lb. To meet the demand Mexican producers would have to double the present output.

Trade with Sweden

In a recent report on trade between South Africa and Sweden in 1953 it is stated that the principal items supplied from the Union in the category of chemicals are chrome salts and chromic acid. Prices of these items fluctuated widely during the year, resulting in the concentration of demand on sources of supply close at hand, such as Western Germany. The value of these South African sales was Sw.Kr.1,178,000.

Seas Wash Up Rutile

Rough seas during the past four months have deposited on the beach at Yamba, on the New South Wales coast, thousands of tons of black sand containing rutile. About 80 per cent of the rutile being used in the USA for titanium production is mined from the beaches of New South Wales, and US company officials in Australia at present are investigating the deposits.

Chilean Nitrate Sales Up

Production of nitrate by the Chilean Nitrate and Iodine Sales Corporation for the year ending June, 1954, was over the quota of 1,400,000 tons. About 700,000 tons were shipped to the US, and the remainder to Europe, the Middle East and other Latin American countries. Prospects for the coming year are believed to be favourable, due to improving competition against synthetic nitrate.

Increased Tungsten Production

Argentina's second five-year plan contemplates increasing production of tungsten concentrates to 5,000 tons a year. It is expected that new concentration plants and other equipment will be bought soon to get this programme under way. Present production is about 1,800 metric tons a year; about 80 per cent is in the form of wolframite ore concentrated to 65 per cent, and the rest is scheelite concentrated to 55 per cent.

Polish Nitrogen Works

The Praesidium of the Polish Government has recently taken action to ensure that the construction of the Kedzierzyn nitrogen works, the first part of which has already begun production, will proceed according to schedule. The works will turn out more than half of all the nitrogen fertilisers to be produced in Poland.

Malayan Tin Exports Up

Exports of tin from Malaya to the United States in July were 4,163 tons, the highest of any month of this year. In the first seven months of the year exports to the USA were 24,542 tons, compared with 16,250 tons in the same period last year. Exports to the United Kingdom dropped from 5,321 tons to 2,037 tons.

Tin Producers Agree to Price Drop

After a referendum Malayan tin producers have agreed to a French proposal that the ceiling price under the International Tin Agreement should be lowered from £880 to £840 a ton. Slightly more than a quarter of those who voted were against the proposal; 13.5 per cent abstained.

Canadian Fertiliser Plant

Plans are nearing completion for a proposed $18,000,000 fertiliser plant in Southern Alberta, officials of the New British Dominion Oil Company announced following a meeting of shareholders at Calgary. The plant would be used for producing ammonium nitrate from gases drawn from the company's well in the Etzikom area, a spokesman said.

Australian Plant for New Refinery

About 75 per cent of the machinery for the new oil refinery which is being built by Caltex Ltd. at Kurnell, New South Wales, will be made in Australian factories. The project is one of the biggest engineering jobs now being carried out in Australia, and will cost £A25,000,000. The refinery's capacity will be 1,000,000 tons of crude oil a year, most of it from Sumatra. It is also planned to build a wharf 3,600 ft. long. The refining units to be installed include a flexible two-stage distillation unit, and a catalytic cracking unit with gas recovery facilities.

· PERSONAL ·

A.P.V.-Paramount Ltd. announce that MR. J. F. B. JACKSON, B.Sc., A.R.I.C., F.I.M., is shortly to join their board as director in charge of their new foundries, producing castings in special steels and non-ferrous alloys, that were opened at Crawley, Sussex, early last year. Mr. Jackson, an authority of international reputation on steel castings, has relinquished his position as director of the British Steel Castings Research Association in order to take up this new appointment.

Four appointments in the sales department of Shawinigan Chemicals Ltd., in Montreal, are announced. MR. TERRENCE A. GILL, domestic sales manager until now, becomes administrative assistant for sales; and MR. GORDON H. MACDOUGALL, export sales manager, has been named assistant general sales manager. MR. DONALD O. TIRRELL succeeds Mr. Gill as domestic sales manager and MR. KENNETH C. CLARKE has been named to succeed Mr. MacDougall as export sales manager.

MR. A. C. VIVIAN, lately project manager for the big post-war expansion scheme at Anglo-Iranian's Llandarcy Refinery, retired at the end of last month after 30 years' service with the company. More than a quarter of a century ago Mr. Vivian watched over the building at Abadan of the first pipe still units, fractionating columns and other plant; but most of his career was spent in the London office, where he was manager of the civil and general branch of engineering division from 1935 (with a break during the war years) until 1947. During the first three years of the war he worked at War Office factories and Air Ministry depots and afterwards was acting chief of the company's engineering division in London. He was appointed project manager for the expansion of Llandarcy Refinery towards the end of 1947.

The United Kingdom Atomic Energy Authority announces the appointment of MR. K. L. STRETCH as works manager at Calder Hall, Sellafield, Cumberland, where Britain's first atomic power station is now under construction. Mr. Stretch, who will take up his appointment later in the year, is at present with the Salt Division of I.C.I. Ltd. He is an M.A., a Barrister-at-Law and an Associate Member of the Institutes of Civil, Mechanical and Electrical Engineers. Born in Antigua, British West Indies, in 1917, he was educated at Merchant Taylor's School, Crosby, and King's College, Cambridge, and started his apprenticeship with Mather & Platt Ltd., Manchester, in 1939. Soon afterwards he was commissioned in the Royal Artillery and was later transferred to REME. Mr. Stretch is married and lives at Sandiway, Cheshire, with his wife and two daughters.

The Atomic Energy Authority has also announced that MR. R. J. COOK, chief of the Royal Naval Scientific Service, has been released from his present post to take up that of Deputy Director of the Atomic Weapons Research Establishment, Aldermaston, Berkshire, where Sir William Penney is Director. Mr. Cook will move to his new post on 1 September, but for a short time after that will continue to help the Admiralty. He is 49 and between 1947 and 1950 was Director of Physical Research at the Admiralty.

MR. F. C. How has been appointed Secretary of the Office of the Lord President of the Council (Atomic Energy), a newly-created office designed to act as a liaison between the Government and the Atomic Energy Authority. Aged 56, Mr. How was appointed under-secretary, Ministry of Supply, in 1946 and remained there until last year, when he became under-secretary in the secretariat of the department of atomic energy.

MR. IAN D. LYLE, chairman of Tate & Lyle, has been elected a director of the Canada and Dominion Sugar Company of Chatham, Ontario, Canada.

Three new departmental general managers were appointed by The Texas Company, of New York, on 9 August. DR. WAYNE E. KUHN was named general manager of the newly-created research and technical department; MR. JAMES V. C. MALCOLMSON, general manager, marine department; and MR. THEODORE A. MANGELSDORF, general

manager of the refining department. Dr. Kuhn has been manager of the company's technical and research division since September, 1938. Until last week, the research organisation of The Texas Company had functioned as a division of refining. As the research and technical department, it now has departmental status. Dr. Kuhn received a B.A. in science from Reed College in 1925 and a Ph.D. in chemistry from Cornell University in 1929, the year he joined The Texas Company. After eight years at the company's Port Arthur, Texas, refinery, he was transferred to New York headquarters. His society memberships include the American Chemical Society, the Society of Automotive Engineers, and the American Institute of Physics. Last year he was president of the Commercial Chemical Development Association. Mr. Malcolmson is a graduate of the Belfast, Ireland, College of Technology. He came to the United States in 1936 as Lloyd's Senior Surveyor in charge of the Philadelphia district, remaining there until December, 1942, when he joined the construction and repair division of Texaco's Marine Department. His most recent appointment was as assistant general manager of that department. Mr. Mangelsdorf is a graduate of the Massachusetts Institute of Technology. He received a B.S. in chemical engineering in 1926 and an M.S. in fuels engineering in 1929. He was on the teaching staff of MIT from 1926 through 1933, the year he joined The Texas Company. For nine years he worked at Texaco's Port Arthur, Texas, refinery in engineering and chemical posts. In May, 1942, he was named assistant superintendent of the Lockport, Ill., refinery, and five years later was appointed superintendent. He returned to Port Arthur as general superintendent in 1950, and in 1953 assumed his last previous post as manager of the operations division of the refining department, in New York City.

The University Court of St. Andrew's University, Scotland, has appointed DR. A. D. WALSH, Reader in Physical Chemistry in the University of Leeds, to be Professor of Chemistry in Queen's College, Dundee.

MAJOR-GENERAL I. P. DE VILLIERS has been appointed to the Board of African Explosives and Chemical Industries, with MR. J. MORRISON as alternate director. MR. E. H. FARRER has resigned from the board.

MR. R. M. GIBB will succeed MR. R. POLLARD, the Dyestuffs Division Distribution Manager, when the latter retires from Imperial Chemical Industries Ltd., Blackley, Manchester, on 31 August. Mr. Gibb was formerly division assistant secretary.

The directors of Davey, Paxman & Co. Ltd., Standard Ironworks, Colchester, announce that for personal reasons SIR JOHN GREAVES has decided to relinquish his position as managing director of the company on 30 September. Although he continues as a director of Ruston & Hornsby Ltd., he will be retiring from the board of Davey, Paxman & Co. Ltd. The directors wish to place on record their great appreciation of the most valuable services rendered by Sir John during the five years he has been managing director. MR. G. W. BONE, assistant managing director, has been appointed to succeed him.

Obituary

MR. A. W. COLE, of Washington (Co. Durham), a retired director of the Washington Chemical Co., has died at the age of 70. He was a member of Washington Urban Council for 27 years.

Wills

MR. ARTHUR WILLIAM COWBURN, J.P., of Booth's Hall, Knutsford, Cheshire, and Maes-y-Mor, Llandudno, chairman of Cowburn and Cowper Ltd., chemical manufacturers, of Trafford Park, left £122,054, net £67,850.

South African Detergents

Savotex Industries Ltd. are now producing in their Johannesburg factory Merlon basic detergents. These are of the anionic alkyl aryl sulphonate type. The material is available in slurry (paste) concentrations of 30 per cent and 40 per cent active matter (up to 85 per cent on an anhydrous basis) and as 60 per cent drum-dried flakes. The firm is working to high technical standards so that the product is comparable with similar imported lines and prices are competitive. This firm also has a factory in Port Elizabeth, once part of the plant of United Soaps Ltd., which is producing a range of synthetic detergents for industrial uses.

Publications & Announcements

CLAIMS that no pump in the world will last so long and cost so little to maintain when handling highly abrasive substances such as sand, gravel or ash in water, are made for the Linatex centrifugal pump in a new brochure published by Wilkinson Rubber Linatex Ltd., Camberley, Surrey. Suitable for both abrasive and corrosive liquids, the pump is designed to prevent metallic contamination of pump contents. If the rubber covered parts become worn during use, they can be re-surfaced without difficulty. In special cases, chemically-resistant synthetic linings can be provided. The pumps are available in four patterns, with a number of rates of output.

* * *

MUCH has been written on the subject of stainless steel welding in recent years, but frequently the information is so highly technical that the average fabricator has difficulty is understanding just how it applies to his particular job. On the other hand practical articles tend to leave the reasons for the recommended procedures very much to the imagination of the reader. The aim of 'Some Notes on the Welding of Stainless Steel,' recently published by Rockweld Ltd., Commerce Way, Croydon, is 'to bridge the gap between theory and practice without going too deeply into either field.' Subjects dealt with include choice of steels and electrodes; coatings; distortion; corrosion resistance; porosity; and cracking and fissuring.

* * *

EXTRA high intensity tramp iron diverter unit has recently been developed by Rapid Magnetic Machines Ltd., Lombard Street, Birmingham, 12, to cater for burdens too large, or too numerous, to be dealt with adequately by the conventional design of drum or pulley. The limiting factor inherent in the usual design is the restriction of winding space. One answer to the problem lies in the use of elongated static coils which suffer the disadvantage of an inevitable wasteful excess of magnetic flux and an uneconomical development of magnetic strength. In the new unit, it is claimed a field strength of approximately four times as great as with the equivalent size of pulley or drum has been attained. Total enclosure of the stationary energising coils, the absence of slip rings, incorporation of dust-proof ball bearings throughout, coupled with a minimum of moving parts, ensure a long life with negligible maintenance.

* * *

A NEW technical bulletin on 'Carbowax' methoxy polyethylene glycols has just been released by Carbide and Carbon Chemicals Company. Physical properties, specifications, and shipping data are included for the methoxy polyethylene glycols 350, 550, and 750. Comparative wetting efficiencies of fatty acid ester derivatives are also included. Fatty acid monoesters of the Carbowax methoxy polyethylene glycols are particularly useful as detergents and emulsifying, dispersing, wetting, and penetrating agents. These methoxy polyglycols are effective plasticisers for film-forming cellulose derivatives and are of interest as chemical intermediates and in speciality products. A recent addition to this group of products, Carbowax methoxy polyethylene glycol 250, extends the molecular weight range of the series and makes possible the synthesis of fatty acid monoesters with large hydrophilic groups than was formerly possible. Copies of this new technical bulletin (F-6736) are available from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

* * *

THE 1954 edition of the British Standards Yearbook lists 2,500 British standards current at 31 March, 1954, and gives a brief description of the subject matter of each. There is a comprehensive index. The book contains over 500 pages and gives the usual information on the membership of the Institution's General Council, Divisional Councils and Industry Standards Committee, together with the names of representatives on the main special committees and advisory committees.

* * *

A catalogue produced by Quickfit & Quartz Ltd., manufacturers of interchangeable laboratory and scientific glassware of Stone, Staffs, will be included in the exhibition of the hundred best catalogues of 1953-54 organised by the British Federation of Master Printers and the Council of Industrial Design. This exhibition will tour the main provincial towns before coming to London in the autumn.

Law & Company News

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

CRONE & TAYLOR (FERTILISERS) LTD., St. Helens. 12 July, first debenture to Westminster Bank Ltd., securing all sums due or to become due to the bank from Crone & Taylor Ltd., but not exceeding £25,000; general charge (subject to etc.).

DENVER CHEMICAL & METAL REFINING CO. LTD., Barking. 14 July, agreement securing to S. J. Barnett, London, £7,500; charged on 100 tons of zinc plates. *£20,000. 22 May, 1952.

WESTWELL LIME & FERTILISER LTD. (formerly WESTWELL ORE & FERTILISER LTD.), London, E.C. 9 July, mortgage and charge to National Provincial Bank Ltd., securing all moneys due or to become due to the bank; charged on land and lime works, Beacon Hill, Westwell, Charing, with plant, machinery, etc., and a general charge. *Nil. 27 April, 1951.

Satisfactions

BRITISH ANTHRACITE CO. LTD. (formerly Anthracite Holdings Ltd. and British Anthracite Sales Ltd.), London, E.C., and British Anthracite Sales Ltd. (formerly Welsh Anthracite Sales Ltd.), London, E.C. Satisfaction, 16 July, of supplemental trust deed registered 11 April, 1946.

H. RUSSELL (SOAPS AND DISINFECTANTS) LTD., Liverpool. Satisfactions, 16 July, of mortgage registered 27 December, 1946, to the extent of £650 and of further charge registered 2 December, 1952.

New Registrations

Surfactants & Allied Chemicals Ltd.

Private company. (536,709.) Capital £500. Manufacturers, importers and exporters of and dealers in chemicals, gases, drugs, medicines, etc. Directors: Gertrud Levi, Samuel Blaser and Harry Kingsley. Reg. office: 17 Station Road, Swinton.

Barnstaple Paint & Lacquer Co. Ltd.

Private company. (536,652.) Capital £2,000. Manufacturers of and dealers in paint, lacquers, etc. Directors: Norman Boyes and Violet E. Boyes. Reg. office: Chivenor, Braunton, N. Devon.

Yardley (Rayleigh) 1954 Ltd.

Private company. (536,838.) Capital £2,000. Manufacturing, wholesale, pharmaceutical, retail, consulting, research, analytical and dispensing chemists, opticians, etc. Directors: Mrs. Winifred S. Unwin, Geoffrey W. Unwin, Geo. W. Smith and John Preston. Reg. office: 111 High Street, Rayleigh, Essex.

Protective Chemicals Ltd.

Private company. (536,674.) Capital £250. Merchants, traders, importers and exporters of and dealers in rotproof, waterproof and flameproof materials, etc. Directors: Roland S. Baker, Geo. A. P. Baker, and Robt. C. Hadaway. Reg. office: 35/7 White Post Lane, Hackney Wick, E.9.

Richard Wall Ltd.

Private company. (536,405.) Capital £2,000. To carry on the business of manufacturing, pharmaceutical, analytical, photographic and dispensing chemists, pharmacists and druggists, opticians, etc. Directors: Richard M. Wall and Reginald L. Wall. Reg. office: 9 Arundel Street, London, W.C.2.

Crispin Supplies Ltd.

Private company. (536,451.) Capital £5,000. To carry on the business of manufacturers of and dealers in all kinds of goods of leather, leather substitutes, rubber, rubber substitutes, chemicals, cements, wood, wax, etc. Directors: Leslie J. Smalley and Thos. G. Frost. Reg. offices: 4 Horsefair Street, Leicester.

Phare Ltd.

Private company. (536,294.) Capital £500. Manufacturers of and dealers in chemicals, drugs, medicines, etc. Directors: Edmund T. Ellis and George A. Walsham. Reg. office: 11 Town Hall Street, Grimsby.

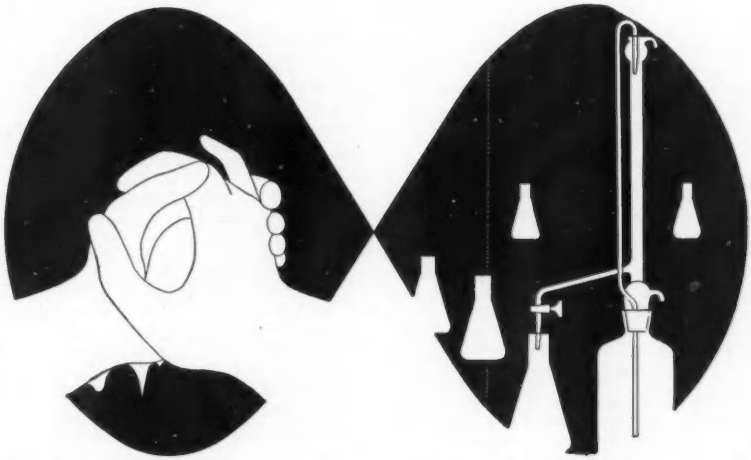
Rosmarine Manufacturing Co. (1954) Ltd.

Private company. (536,386.) Capital £1,000. Manufacturers of and dealers in

[continued on page 388

The common test of tincture of soap

" Dr. Clark then exhibited his method of ascertaining quantitatively the comparative hardness of water by means of the common test of tincture of soap, illustrated by experimental evidence, to prove the accuracy of which it is susceptible and the facility of its application."



Dr. Clark gave his demonstration at one of the first meetings of the newly formed Chemical Society in 1841, and the above is an abstract from Volume I of the Proceedings.

The B.D.H. catalogue still includes Clark's Soap Solution and testifies to the remarkable permanence of his technique. Greater accuracy and convenience in total hardness determination, however, are now obtained from the B.D.H. Hardness Solutions and Indicator based on the use of ethylenediamine-tetracetic acid as advocated by Schwarzenbach and others.

LABORATORY **B·D·H** CHEMICALS

THE BRITISH DRUG HOUSES LTD. B.D.H. LABORATORY CHEMICALS GROUP POOLE DORSET

LC/P/6

continued from page 386

perfume, cosmetics, drugs, chemicals, etc. Directors: Wm. H. Kendrick, Mrs. Hilda L. Kendrick and Donald J. Skinner. Reg. office: 17 Berkeley Street, London, W.1.

Change of Name

The following change of name has been announced:—COOKS CHEMISTS (NOTTINGHAM) LTD. to COOK & DALE LTD., on 30 June.

Company News

Solignum Ltd.

Solignum Ltd., wood preserving, stain, paint, etc, manufacturers controlled by Major & Co. Ltd., announces a dividend of 15 per cent for the year to 31 March, 1954, against 12½ per cent. The group net profit applicable to the parent company is £17,930 after tax of £21,038.

Pinchin Johnson

Pinchin Johnson and Associates, paint, etc., manufacturers, have raised the annual dividend from 20 per cent to 25 per cent. Combined profits, including investment income, expanded from £1,546,807 to £1,976,218 and the net profit, after all usual charges, from £538,241 to £695,026.

Nickel in 1953

Expansion of nickel-producing facilities in Canada and the United States and search for new sources of nickel in many parts of the world were carried on with intensity in 1953, says the US Bureau of Mines in a yearly report. Activities included much exploration work, developing and equipping several new mines, erection of plants to treat nickel-bearing pyrrhotite, additional matte-producing capacity, and construction of new refining plants. Although much progress was made by established producers in expanding production and by new producers in installing facilities, no new refining units were completed in 1953. Refining plants scheduled for completion in 1954 will have capacity to produce about 17,000 short tons of refined metal. As a consequence, it is estimated that equipped mines outside the USSR will have capacity to produce about 200,000 short tons of nickel annually by the end of 1954. Total world mine production of nickel outside the USSR was about 16,000 short tons greater in 1953 than in 1952. Canada, Cuba, New Caledonia, and Union of South Africa showed gains, but output in Finland and the United States declined slightly. Canada produced 80 per cent of the total in 1953.

Market Reports

LONDON.—Most sections of the industrial chemicals market have a settled appearance and the movement to the chief consuming industries has, in the aggregate, been of fairly substantial dimensions. There has also been a good volume of export inquiry, mainly from Commonwealth sources. The price position generally is unchanged with the undertone continuing firm, but there has been an increase in the prices of lead compounds from 18 August. Dry white lead has increased to £132 5s. per ton, dry red lead £126 5s. per ton, and litharge £125 5s. per ton. The various sections of the industrial and fine chemicals market are without special feature, nor has there been any change in the coal tar products market, where producers have no difficulty in finding an outlet on the home market.

MANCHESTER.—A generally steady undertone continues to be reported on the Manchester market for heavy chemical products. Additional inquiry during the past week has been fairly active and has covered a wide range, with contract deliveries to the leading home consumers, including the textile trades, on a satisfactory scale. A fair flow of specifications from shippers is also being dealt with. Buying interest in fertiliser materials is much the same as during recent weeks, a moderate weight of business in the aggregate having been arranged. Most of the by-products, both light and heavy, are meeting with a steady demand.

GLASGOW.—The impact of the holiday break is still very much in evidence, although business generally speaking has been somewhat brisker with agricultural chemicals in very good demand. Prices again have been more or less steady, although slight increases have been shown in some lead salts. On the whole a favourable period of trading is reported from most sections of the industry.

COMPANY MEETING

The Distillers Company Limited

Excerpts from Chairman's Statement issued with Directors' Report and Accounts

THE trading profit of the Group for the year to 31 March, 1954, amounted to £19,717,540 compared with £13,030,747 for the previous year. Although most sections of the Company's business contributed to this result, the improvement was largely due to the greater volume of Scotch Whisky which it was possible to export during the year and to the marked recovery by our Chemical and Plastics Divisions. I shall refer to these in greater detail later. After charging Depreciation and Interest on Loans, the net profit was £17,632,289 against £11,059,297. Taxation provisions required £9,805,472 and of the balance, £510,268 belongs to other participants in certain subsidiaries.

The Distillers Company's share is accordingly £7,316,549 compared with £4,101,072 last year.

As you are already aware, we acquired the entire share capital of Train & McIntyre Ltd. during the year and as part of the consideration 2,000,000 Ordinary Shares of 4s. each were issued at the then current market value of 17s. per share. This transaction accounts for the major portion of the increase in our Issued Capital and in our Capital Reserves by way of Share Premium Account. The balance of the increase is the result of the conversion of part of our Unsecured Loan Stock 1964. I should perhaps remind the remaining holders that the same rate of conversion is open to them this November, after which the terms become less favourable each year.

Scotch Whisky

We have again achieved a satisfactory measure of production at our Malt and Grain Distilleries. Last year, I referred to the fact that a large proportion of the stocks of Scotch Whisky held by the Industry was not yet adequately matured and available for sale. Unfortunately this state of affairs still exists although the position has slightly improved. We have, during the past year, acquired certain substantial stocks which will enable us to increase the quantities available for sale in the near future. Maintenance of age and quality still remains the controlling factor in the expansion of our sales both at home and abroad.

Sales of Scotch Whisky, for a number of years, have been the subject of an arrangement between HM Government and The Scotch Whisky Association. Under this arrangement, the Industry undertook to limit its sales in the Home Trade to a specific figure and to endeavour to achieve certain suggested targets in the Export field. While paying tribute to the harmonious and helpful relations between HM Government and the Industry, I am glad to say that intimation was received from the Government to the effect that as from 1 January, 1954, each individual firm would be left free to adopt its own pattern of trade. This was, however, subject to an understanding that every effort would be made to increase our Export sales and in particular, exports to the dollar areas. We have therefore now reached the stage when we can produce our Whisky without restriction in volume and sell it with greater freedom than has been possible for a long time.

The year 1953 was one of notable achievement for the Scotch Whisky Industry as a whole. Export sales amounted to no less than 13.2 million proof gallons, the highest figure ever recorded. This compares with a pre-war figure of approximately 8 million proof gallons. In the Home Trade, releases amounted to 4.35 million proof gallons. This was the highest figure attained since 1947, but it is, of course, markedly less than the pre-war consumption of approximately 7 million proof gallons.

As from 1 January, 1954, our Group Companies have been able to increase their releases to the Home Trade to some extent. The additional quantities available have been readily taken up and it is clear that the demand for our brands in the Home market is still in excess of supply. With regard to the Export Trade, here again we have been able to allocate for 1954 larger quantities than were available in 1953, but this still leaves unsatisfied the demand which exists in the great majority of our Overseas markets.

A large percentage of our export business is done with the United States. I am glad to say that certain of my colleagues who have recently visited this market have reported that the demand for our leading brands continues to be as strong as ever. Shipments of Scotch Whisky to the United

States during 1953 were the highest in the history of the Industry and reached a total of 7.1 million proof gallons, equivalent to 4¾ million cases.

Gin

Once again I am glad to report a successful year's trading by our Gin Companies, with substantially increased home and export sales. It may be prudent, however, to add a warning note in that as Whisky supplies reach the Home market in gradually increasing volume, the upward trend in Gin sales may be arrested, or perhaps modified.

Yeast

As indicated in my statement last year, the demand for Bakers' Yeast has contracted somewhat in recent years, and this trend continued during the past year, mainly due to the lower consumption of bread resulting from the freer supply of other foodstuffs. Despite this, our Yeast factories have been kept reasonably well employed. Competition for the smaller tonnage of Yeast required by Bakers has been keen, but the introduction by your Company of process improvements and economies in distribution has enabled us to effect appreciable reductions in the selling prices charged to consumers. In an endeavour to reduce distribution cost still further, the Company has entered into an arrangement with The Standard Yeast Company Limited (a subsidiary of United Dairies Limited) under which, as from 1 April, 1954, although that Company continues the production of its well-known brand of 'Standard Yeast,' our subsidiary, The United Yeast Company Limited, has undertaken the sale and distribution of its output. Reports from our distribution centres show that this arrangement has worked smoothly and has been well received by the Bakery Trade.

We were recently informed that under an arrangement entered into between the British and certain Continental Governments, the importation of Yeast from Holland and elsewhere in Europe would be permitted on a limited scale as from 1 July, 1954. There is an excess productive capacity in this country at the present time, and little prospect of any marked increase in the general use of Yeast. Whilst our modern plants and low selling prices should equip us to meet any normal competition, it remains to be seen what impact such foreign importation may have upon our domestic economy.

Industrial Group

I am glad to be able to report that following upon the sharp recession to which I referred in my previous statement, the year now under review was one of steady recovery and progress for most of our Divisions. This reflects not only the marked improvement in general trade, but also the coming into operation of new plant and reorganisation programmes.

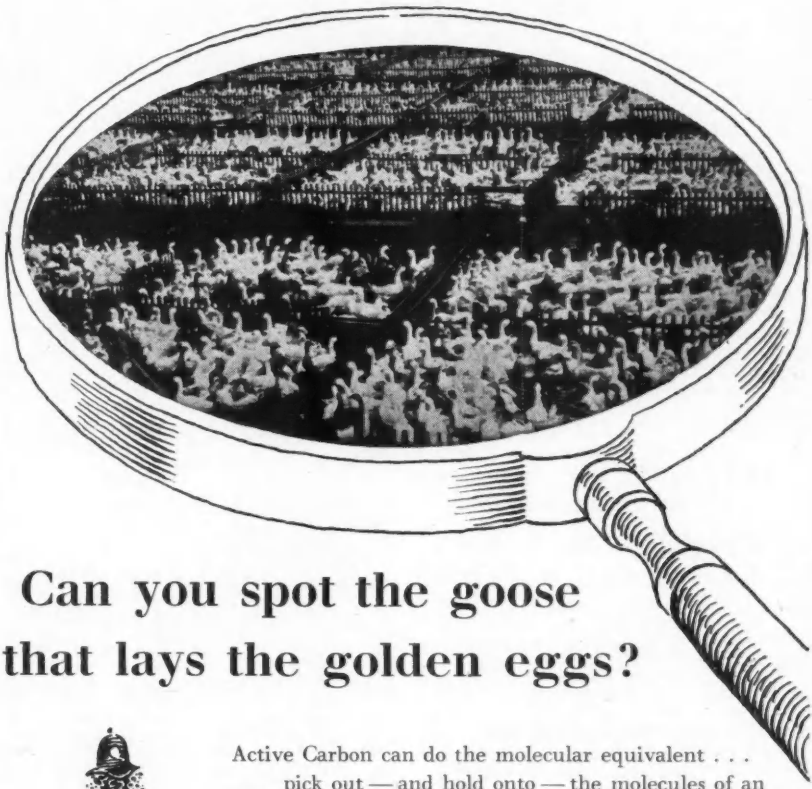
Most raw materials have been in free supply at somewhat lower levels, which has enabled us to reduce the prices of our products with beneficial effect upon our sales and earnings. The chemical industry continues to develop at a rapid rate, and although in Britain, because of the limitations imposed upon industry by the crushing weight of taxation, the capital invested each year does not compare with the enormous sums expended in the USA or Germany, nevertheless, the total figure is impressive and we have contributed our share.

New products of great value and wide application are constantly emerging from the chemical laboratories of the world and we have to see to it that we do not fall behind in this competitive but constantly expanding field.

Chemical Division

The British Petroleum Chemicals plant at Grangemouth has had a very successful year and its output of synthetic ethyl alcohol now forms a substantial part of our total industrial alcohol production. I am glad to say that we shall this year receive a maiden dividend from this associate company, and its future appears to be most encouraging. A contract has been concluded between British Petroleum Chemicals Limited and the Oronite Chemical Company, a subsidiary of the Standard Oil Company of California, USA to produce detergent alkylates used in the manufacture of synthetic detergents. This plant will be located at Grangemouth, and it is hoped will come into operation before the end of 1955. The monomeric styrene plant of Forth Chemicals Limited (a subsidiary of British Petroleum Chemicals Limited) has operated at maximum capacity, and in view of the growing demand for this material for the manufacture of polystyrene and other important uses, it has been decided to double the capacity. This work is now in hand.

Our industrial alcohol distilleries have operated satisfactorily, and the price of molasses has remained reasonably stable. Sales are at a high level, but in view of our production of synthetic ethyl alcohol at Grangemouth and in order to secure maximum economies, we have concentrated production at three distilleries and have meanwhile closed down those at Liverpool and Greenock.



Can you spot the goose that lays the golden eggs?

Active Carbon can do the molecular equivalent . . . pick out — and hold onto — the molecules of an expensive solvent dispersed in the air, for instance.

In hundreds of dry-cleaning works, chemical works and paint shops the use of Active Carbon pays handsome dividends. But solvent recovery is only one of its gifts: it can also remove unwanted colours, unpleasant odours and tastes. It is used as a catalyst carrier in the manufacture of P.V.C.: and the purity of many foodstuffs and many pharmaceuticals owes a lot to Active Carbon; the experts in charge are

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CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

UNIVERSITY OF MANCHESTER

THE NEXT SESSION COMMENCES ON THURSDAY, 7TH OCTOBER, 1954.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

A VACANY exists for a **SHIFT SUPERVISOR.** Qualifications InterB.Sc. or equivalent, with some chemical works experience. Age range 26-36 years. Salary according to age, qualifications and experience. Apply **GENERAL WORKS MANAGER, THE FULLERS' EARTH UNION, LTD., "PATTESON COURT," NUTFIELD ROAD, REDHILL, SURREY.**

CHEMICAL ENGINEER required by prominent Company in Westminster district. Qualifications required are: Age about 30; B.Sc. or equivalent; good knowledge Physics, Mathematics and Chemistry desirable; practical works experience of assistance; understanding of general office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications, coupled with a keen business outlook. Write, stating fullest possible particulars, including age, qualifications and salary required, to **BOX No. C.A. 3347, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

THE DISTILLERS COMPANY, LIMITED.

THE Company has a number of openings for **QUALIFIED SCIENTISTS** for research, development and production supervision, as a result of expanding programmes in the fields of Synthetic Organic Chemicals, Polymers, Antibiotics, Yeast and Industrial Alcohol.

Interesting and progressive positions are available in these fields for Chemists, Biochemists, Chemical Engineers or for specialists in Chemical Analysis, Spectroscopy, Micro-biology and Chemical Plant Instrumentation. The posts are tenable in the London, Cardiff, Liverpool and Hull areas, and good salaries are offered appropriate to a candidate's experience and qualifications. A non-contributory pension scheme is in operation.

Posts are available for graduates both with and without industrial experience, and may be of special interest to those who are shortly completing their National Service. Interested men and women are invited to apply to the **STAFF MANAGER, THE DISTILLERS CO., LTD., 21, ST. JAMES'S SQUARE, LONDON, S.W.1.** quoting Reference **DCL/G1.**

IMPERIAL SMELTING CORPORATION, LIMITED, has two vacancies in the Research Laboratory for a **PIGMENTS ASSISTANT** and in the Development Department for an **INSTRUMENTS ASSISTANT.** The minimum qualifications are H.N.C. in appropriate subjects and at least three years' experience in the type of work involved. Commencing salary in both cases will be dependent on individual qualifications and experience. Applications to **PERSONNEL MANAGER, IMPERIAL SMELTING CORPORATION, LIMITED, ST. ANDREW'S ROAD, AVONMOUTH, NR. BRISTOL,** quoting Reference **PIA./C.A**

SITUATION WANTED

WILL any employer offer employment, within the industry, clerical or otherwise, to an educated man (First Class Hons. M.Sc.), who has spent a lifetime in the Ashphalt and Colouring Matters Industry, but who through no fault of his own (ill-health) came upon a period of unemployment. Now recovered. Good references. Congenial employment more important than finance. **BOX No. C.A. 3346, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

ECONOMIC BOILERS, Two Brand New 14 ft. by 8 ft. by 150 lb. w.p. **IMMEDIATE DELIVERY.** 400 other Boilers in stock.
STAINLESS PRESSURE TANK, 19 ft. by 5 ft. diam., 110 lb. w.p. Unused.
Wheeoe Riveted Steel **MIXING TANK,** 13 ft. diam. by 15 ft. deep, 9-16 in. plate, cone base.
TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**
SIX Stainless Steel **JACKETED PANS,** 60 galls.
TWO Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m.
SIX Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ¾ in. o.d.
FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lb. w.p. Numerous other sizes.
Solid Drawn **STEEL PIPES,** 6 in., 8 in., 10 in., 12 in., 14 in., thousands of feet in stock, plain and flanged.
CAST-IRON PIPES. 400 yds. 8 in. **NEW.** Also most other sizes, up to 24 in. bore.
VALVES in Stainless, Gunmetal, Enamel Lined.
Free Catalogue. "Watkins Machinery Record," available.
FRED WATKINS (BOILERS), LTD., COLEFORD, GLOS.

JOURNALS AND PERIODICALS in sets and back files. bought and sold. American, British, Foreign—Chemical Scientific, Technical. Large stock. Catalogues issued. **J. S. CANNER, INC., BOSTON, 19, MASS., U.S.A**

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.
TWO DE LAVAL SEPARATORS, VEE-BELT DRIVE. Good condition.
THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET, LONDON E.14. TEL. EAST 1844

1,000 × **45/50-GN. STEEL DRUMS.** Solid rolling hoops. Tare weight about 112 lb. First-class condition, perfect shapes. Roughly washed after Lactic Acid. To clear, 9s. 6d. each, ex-site.
GEO. H. WARD, 20, REDCROSS STREET, LIVERPOOL, 1.

FOR SALE

C. BARBER, LTD.

SEVERAL HORIZONTAL JACKETED TILTING MIXERS, 25 gallons capacity. New and unused.
500-gal. Over-driven M.S. **MIXING VESSEL.** M.S. pressure filter, 4 ft. 3 in. diam. by 5 ft. 3 in. overall height.
CANNON STEAM JACKETED ENAMEL-LINED PANS 10 and 25 gallons. All new and unused.
DOULTON 25-gal. **COPPERS** with lids. **NEW** and unused.
WELDED VESSELS of all types, in mild steel or stainless Fabricated to customer's specifications.
HORIZONTAL TRIPLE ROLL MILLS with chilled iron rolls, in excellent condition. Various sizes.

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STORAGE VESSELS

22—All Welded Tanks 30 ft. by 8 ft. diam. Dish Ended Horizontal, ½ in. plate, eaeh with Manholes and Covers
3—Ditto but 30 ft. by 7 ft. diam.
5—All Welded Vertical Cone Based Vessels 9 ft. diam. by 11 ft. 6 in. deep by ⅜ in. plate.
4—All Welded Tanks 12 ft. by 6 ft. diam. ⅜ in. and ¼ in. plate.
2—Ditto. 10 ft. by 5 ft. diam. ¼ in. plate
2—Vertical Aluminium Tanks Closed, 9 ft. diam. by 10 ft. deep.
8—All Welded Vertical M.S. Tanks 4 ft. diam. by 7 ft. high.
100—Vertical All Welded M.S. Tanks 3 ft./7 ft. diam. by 3 ft. 6 in./5 ft. deep.
4— Riveted Vessels 8 ft. diam. by 8 ft. deep by ½ in. plate.

ALL IN EXCELLENT CONDITION
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Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 21 August, 1954. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.

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